DOCUMENT RESUME

ED 209 282 TM 810 779

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TITLE Report on the Maintenance Division and School Plant Operations.
INSTITUTION Montgomery County Public Schools, Rockville, Md. Dept. of Educational Accountability.
PUB DATE Nov 80
NOTE 189p.

EDRS PRICE MF01/PC08 Plus Postage.
DESCRIPTORS *Building Operation; Decentralization; Delivery Systems; Elementary Secondary Education; Energy Conservation; *Equipment Maintenance; Program Administration; Program Costs; *Program Evaluation; *School Maintenance; Staff Utilization; Supplies
IDENTIFIERS Custodians; *Montgomery County Public Schools MD

ABSTRACT

The Division of Maintenance of the Montgomery County (MD) Public Schools (MCPS) is responsible for the maintenance and repair of all buildings, equipment, grounds, and facilities. School Plant Operations is not an administrative unit, but a function which includes the operation of plant equipment and custodial and housekeeping services. After an introduction, Part II of the report describes the evaluation of the Division of Maintenance, focusing on costs and budget; decentralization; supplies and equipment; staffing; management, supervision and control; planning and scheduling; delivery of services; and staff stability and training. Part III describes the evaluation of School Plant Operations, focusing on costs and budget; operations staffing; management, supervision and control; planning and scheduling; delivery of custodial services; supplies and equipment; and staff stability and training. A separate section is devoted to Energy Management, focusing on the MCPS energy program, energy auditing, computer control, and the use of natural gas. The final sections provide an overview of Central Management, and a discussion of alternatives for the delivery of service. (Author/BW)

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MONTGOMERY COUNTY PUBLIC SCHOOLS

Report on the Maintenance Division and School Plant Operations

MORE
MANAGEMENT
OPERATIONS
REVIEW &
EVALUATION

EDWARD ANDREWS
Superintendent of Schools

Prepared by the Department of Educational Accountability

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MONTGOMERY COUNTY PUBLIC SCHOOLS
Rockville, Maryland

REPORT ON THE MAINTENANCE DIVISION AND SCHOOL PLANT OPERATIONS

November 1980

Edward Andrews
Superintendent of Schools

EXECUTIVE SUMMARY

REPORT ON THE MAINTENANCE DIVISION AND SCHOOL PLANT OPERATIONS

Part I: Introduction to the Study[1]

In 1979, the Board of Education of Montgomery County Public Schools (MCPS) directed the Superintendent to undertake a series of Management Operations Review and Evaluation (MORE) studies, conducted by or through the Department of Educational Accountability.[2] The Maintenance Division and School Plant Operations were among the first units or functions to be studied, primarily because of the size of their respective staffs and budgets and the relationship between functions.

The Division of Maintenance is responsible for the maintenance and repair of all MCPS buildings, equipment, grounds, and facilities (e.g., athletic fields). In 1977, the division was decentralized, and area maintenance depots were established to serve school administrative areas. A countywide service park, located at Shady Grove Road, houses the division's administrative offices, a central shop which provides some services to all schools, and the depot serving Area 3.

School Plant Operations (or simply Operations) is not an administrative unit, but a function which includes the operation of plant equipment and custodial and housekeeping services. For convenience, however, it is referred to in this report as if it were a unit. The vast majority of Operations staff members are based in schools, and principals and building service managers are the managers of operations functions. The Department of School Services is responsible for Operations staffing, budgeting, and supply management.

Energy management, because of its importance to MCPS, is treated separately in Part IV. Administratively, it is under the Department of School Services, and two individuals in that department are responsible for all energy management activities in MCPS.

Part II: The Division of Maintenance

Costs and Budget (Ch.3)

Between 1969 and 1978, increases in the cost of maintenance services exceeded increases in the total MCPS operating budget; from 1978 to the present, decreases in the Maintenance Division budget have been less than those in the total budget. It is difficult to obtain an accurate picture of all actual maintenance costs to MCPS because some expenditures are budgeted outside the state category for maintenance. Expenditures for code compliance, joint occupancy, the community use of schools, and vandalism also cloud the actual cost picture. In addition, maintenance mechanics are sometimes assigned to jobs done under the capital projects budget, and, at times, a 26-worker renovation team supported by the capital budget performs maintenace work.

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[1] Part and chapter numbers correspond to those in the full report and are provided as a reference guide.

[2] All units of the school system are to be studied except school-based instruction.

For approximately the past 10 years, the Maintenance Division budget has not been based on an assessment of the actual maintenance needs of MCPS. Little or no data have been available on which to base need or cost estimates or to justify expenditures.

Recommendations: (1) Determine and budget for actual MCPS maintenance needs. (2) Keep the maintenance and capital budgets separate.[3]

Decentralization (Ch.4)

Decentralization of the Maintenance Division was justified primarily by financial considerations. It was estimated that there would be a reduction in the number of miles travelled by trucks and workers en route to and from schools. It was assumed that this would result in an increase in the time devoted to maintenance work and that there would therefore be an improvement in maintenance services. Beginning in 1977, the first year of decentralization, the number of miles travelled by maintenance trucks has increased by an average of 60,750 miles per year. Work time has been lost because of the additional hours workers spend on the road. This situation has, to a great extent, been caused by the way in which area responsibilities have been assigned to depots and by the fact that workers must drive from area depots or work sites to Shady Grove Road to pick up supplies. In addition to loss of work time, decentralization has also resulted in a loss of daily supervision by midlevel managers or supervisors.

Recommendations: (1) Depot service areas must be temporarily reassigned while long range alternatives for assignment are being investigated. (2) The supply system must be improved to reduce the number of staff members and vehicles making trips to Shady Grove Road.

Supplies and Equipment (Ch.5)

Maintenance Division supply and equipment needs are not planned in advance on the basis of data which show actual MCPS requirements. Budgeting for equipment is largely a matter of meeting spending guidelines, and the supply budget is based on enrollment. There is almost no pretesting of the $900,000 (FY 1980) worth of supplies and equipment purchased by the division.

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[3] Recommendations in this summary are necessarily brief. The reader should refer to the full report for the findings on which recommendations are based and for complete discussions of recommended courses of action.

Volume buying is now possible for only about 33 percent of the purchases made each year, and supplies which cannot be stocked are bought from local vendors. There are few independent controls on the use of supplies.

Recommendations: (1) Develop a planning system which permits identification of supplies and equipment actually needed. (2) Develop a pretesting program and a program for continuous testing of products. (3) Increase the variety of warehouse stock. (4) Develop an accounting system to cover the actual use of supplies and equipment. (5) Conduct a cost-effectiveness study to evaluate the advantages and disadvantages of establishing area supply depots.

Staffing (Ch. 6)

There are too few managers in relation to the importance of the Maintenance Division's mission and the size of the staff. The central administration consists of only one director and one assistant director (with limited clerical support). Strictly speaking, the five area depot supervisors are not managers. They have almost no control of funds and, because they do not have administrative assistants, they cannot regularly get into the field to inspect work. In addition to depot supervisors, there are also working supervisors (e.g., supervising carpenter), but their distribution and assignment may not be optimal. Of the approximately 400 maintenance mechanics, about 57 percent are trade specialists, while only about 24 percent are general maintenance workers. There is a kind of "trade union" approach to staffing which may limit the division's flexibility and increase costs when several workers are sent to perform a job that could be done by one general maintenance worker.

Recommendations: (1) Increase the number of unit managers and/or assistant managers, including at the depot level. (2) Increase the number of midlevel and job-level managerial and/or supervisory positions (after some other recommendations have been implemented). (3) Develop an information system on which sound decisions about staffing can be based. (4) Investigate the feasibility of reducing the number of trade specialists and increasing the number of general maintenance workers through training and reassignment .

Management, Supervision, Control (Ch.7)

There are formal managerial relationships and responsibilities at the department and division levels, but there are indications that actual managerial control is not as effective as it might be. Responsibilities at the depot level are not so clear-cut, and depot supervisors do not typically carry out inspections of jobs or check with principals about the completion and adequacy of the work which has been performed. Work standards have not been developed or used in the division. The work order system could be a management tool. However, it does not always adequately serve as a means of dispatching workers to jobs and does not provide time, cost, and other management data, even though the work order form is designed to provide the information.

Recommendations: (1) Organize management in such a way as to promote control over all aspects of the maintenance function. (2) Develop a supervisory and inspection system. (3) Determine the resources needed to develop work standards and develop long-range plans for writing work standards. (4) Overhaul the work order system. (5) Study the application of computer technology to both maintenance and school plant operations functions.

Planning and Scheduling (Ch.8)

Neither the Department of School Facilities nor the Division of Maintenance collects, analyzes, or has available the information or data needed to describe the current status of work or to project future needs. There are no standards or guidelines for setting priorities among needs for services, and there is therefore no consistent scheduling. There is no real preventive maintenance program, and there are long backlogs in important long-range maintenance tasks. A newly instituted planning and delivery system may solve some problems but will probably not solve most of the planning and scheduling problems involved in the delivery of the full range of maintenance services.

Recommendations: (1) The planning and delivery system must be designed to include every aspect of maintenance, including preventive maintenance and capital projects. (2) Mechanisms must be developed to collect, analyze, store, and retrieve essential operating and planning information. (3) There must be a system for establishing task priorities and allocating staff which takes all maintenance needs into account. (4) Effective lines of communication, responsibility, and accountability must be established among units responsible for planning, operating, and maintaining school facilities.

Delivery of Services (Ch.9)

There is a system for requesting maintenance services, but correct information is not always obtained from the schools. The time within which the Maintenance Division responds to emergency calls is satisfactory, but this is not true for routine requests, which are often responded to more than a week (or longer) after the request is made. In about a third of the reported cases, maintenance mechanics do not perform requested work the first time they visit a school, and often do not have the proper information, tools, or equipment to perform the job. There are no regular procedures in the Maintenance Division for checking on the adequacy of work or on user satisfaction.

In general, teachers and principals are satisfied with the overall performance of the division. However, they identified many problems, some of which are major and widespread. Responsibilities for maintenance are divided among many MCPS units and because of this, many jobs are not being done effectively or are not being done at all. Renovation work done under the capital projects budget sometimes interferes with the delivery of maintenance services, and administrative offices are sometimes given preferential treatment which results in delaying services to schools.

Recommendations: (1) Develop a plan or system for gathering information on individual school needs for routine maintenance. (2) Identify some school staff members to be responsible for regular inspection and reporting of maintenance needs. (3) Encourage maintenance mechanics to carry out inspections while they are at schools and develop a means for them to report needs. (4) Consider alternative means of delivering services to reduce the time lag between request and delivery. (5) Make it mandatory for maintenance mechanics to report in to some member of the school staff with whom the job request can be discussed. (6) Make it mandatory that the school staff member who "signs off" on a work order must inspect the work before signing. (7) Accord administrative offices the same treatment as the schools when planning and scheduling maintenance services.

Staff Stability and Training (Ch.10)

The maintenance staff is dominantly white and male. As far as can be determined, absenteeism is a problem in the Maintenance Division only because work which would normally be assigned to the individual may not be done when a mechanic is on leave. Staff stability in the Maintenance Division is high. If there is a potential problem of aging and attrition, it would be primarily among supervising mechanics; however, a large number of these workers have many productive years of service in MCPS before retirement. Some kind of training program is needed in maintenance, but it is not clear what kind of training should be offered or to whom. There may already be too many trades specialists in the division, and it would not be desirable at this time to train even more. However, almost half of the mechanics said they need more training in their trades. For the present, there seems to be a need for an in-service training program for working supervisors and, perhaps, for area depot supervisors. At longer range, training must be coordinated with plans for the organization of central management and the delivery of maintenance and operations services.

Recommendations: (1) Develop a system for "covering" high priority work which would normally be done by a worker on leave. (2) Develop and offer an in-service supervisory training program for area depot supervisors and supervising mechanics. (3) Develop no other training programs until decisions are made about staff organization, composition, and the delivery of unified maintenance-operations services.

Part III: School Plant Operations

Costs and Budget (Ch.11)

Budget planning and allocation procedures may be lowering the resource levels of School Plant Operations too rapidly. Beginning in 1977, the Operations budget began to decline more than the total MCPS operating budget. Part of the decrease has been accounted for by salaries, as the number of building service positions decreased at the same rate as enrollment (15%) but at a higher rate than the decline in the number of facilities (9%). Joint occupancy and the community use of schools have placed a financial burden on Operations for which MCPS is not fully reimbursed and for which individual schools are not reimbursed at all.

Recommendations: (1) Make no further cuts in the Operations budget (particularly in staffing) until decisions are made about managerial and operational issues discussed in Parts V and VI. (2) Either raise fees for joint occupancy and community use of schools to cover MCPS's costs or recognize that MCPS is subsidizing these activities. (3) Develop a budget planning process that reflects actual Operations needs and the needs of individual schools.

Operations Staffing (Ch.12)

The Department of School Services developed staffing allocation guidelines in 1965 and again in 1972, but neither set of recommendations was ever followed. If either were applied as a test of the adequacy of staffing in 1980, Operations in MCPS would be badly understaffed. Operations is also understaffed in comparison with other nearby school systems of about the same size as MCPS.

Daily work schedules in the schools account for a minimum number of tasks which workers can usually complete. Many essential jobs are not accounted for on the schedules and a large number of them probably do not get done. It is possible that staffing is adequate and that problems in delivering service are caused by inefficiencies in planning, scheduling, and utilization of the staff. It is probable, however, that Operations is now at the point that further cuts in staffing cannot be permitted until there are sufficient data on which to base decisions.

Recommendations: (1) Realistic staffing guidelines based on extant professional standards should be developed. (2) Up-to-date work plans for each school should be developed. (3) Consideration should be given to alternative ways of deploying the Operations staff to gain increased efficiency.

Management, Supervision, Control (Ch.13)

Managerial and supervisory control over Operations staff and functions are loose. The extent to which the Department of School Services can have an impact on what takes place in the schools is limited under the current organization. Area building supervisors probably do not inspect schools regularly, and in perhaps 30-40 percent of the schools, neither the principal nor the building service manager regularly inspects the work of the building service staff. Work standards have not been developed or used in Operations, and it is therefore doubtful that the importance of performing some major tasks and/or the technical requirements of the tasks are widely known.

Recommendations: (1) Identify or constitute an administrative unit to develop, establish, and monitor compliance with minimum coutywide standards for school plant operations. (2) As soon as possible, begin the development of work standards for the first echelon maintenance of plant equipment. (3) At longer range, develop task frequency standards and work standards for all major tasks, and begin the development of standards for smaller repetitive tasks.

Planning and Scheduling (Ch.14)

There is no overall planning for the delivery of Operations services that begins with the identification of actual school needs and ends with the development of an individual school work plan supported by adequate staff, supplies, and equipment. Therefore, it is probable that at least some schools are understaffed and undersupplied, while others may be overstaffed and oversupplied. School work plans (schedules) are not systematically revised and are not reviewed regularly by area building service supervisors. The community use of schools adversely affects planning and scheduling of the Operations program.

Recommendations: (1) An overall planning system for the delivery of Operations services should be developed. (2) Technical standards and guidelines must be developed as a basis for planning and for developing work plans. (3) Work plans must be revised periodically and be monitored by regular inspections. (4) Consideration should be given to limiting the number of schools used by community groups.

Delivery of Custodial Services (Ch.15)

In general, principals and teachers are satisfied with the overall service provided by the building service staff. However, there are many problems in the delivery of service. As has been said, schedules do not account for all custodial work that needs to be done. Principals and teachers reported that some facilities and/or equipment are not adequately cleaned or cared for. The overlap of responsibilities between Operations and the Maintenance Division aggrevates the situation.

Recommendations: (1) All managerial and supervisory controls which are recommended in this report must be instituted. (2) Work plans must account for all necessary tasks that can be anticipated. (3) Guidelines must be developed to distinguish between tasks and responsibilities of building service workers and maintenance mechanics.

Supplies and Equipment (Ch.16)

Supply and equipment allocations are not determined by a real planning process which takes into account the actual needs of schools. Instead, the equipment budget is based on previous allocations and spending guidelines; the supply budget is based on enrollment. No increase for inflation has been approved in recent years. The lack of planning and the use of what may be inappropriate standards create a situation in which some schools may be oversupplied and some may be badly undersupplied. In the latter case, the delivery of service will be adversely affected. There is no regular supply and equipment testing program. Some new products may be more effective and/or less expensive than those now being used, but the Department of School Services is not given funds to purchase and test them. An inventory system is needed at the school level. Supplies used for instructional purposes and by community groups are not charged to appropriate budgets, and schools are not compensated for them.

Recommendations: (1) Develop a planning system for Operations supplies and equipment, add an inflation factor to the budget, and account for variations in needs among schools. (2) Develop a system for testing products, including new products and procedures. (3) Establish an inventory control system in schools. (4) Charge supplies to appropriate budgets and reimburse schools for supplies charged to other budgets.

Staff Stability and Training (Ch.17)

The Operations staff is dominantly black, male, and comparatively young. Principals and building service managers reported that absenteeism is a problem among Operations staff members. While absenteeism may not actually be excessive, it is a widespread problem, partly because substitutes for absentees cannot be provided. Turnover is a problem among building service workers, but not among plant equipment operators and building service managers. The majority of principals and building service managers reported that the building service staff need more training in both basic custodial tasks and the operation of plant equipment. Training programs are offered by the Department of School Services, but the number and variety of courses are limited. There are few promotional opportunities for building service staff members under the present organization.

Because of the high costs potentially involved if equipment is inadequately maintainted or abused, there is an immediate need to review the recency and adequacy of the training of building service managers and plant equipment operators. If necessary, additional in-service training should be offered in the operation and maintenance of plant equipment. There is also a need to provide building service workers with a formal in-service training program in how to perform basic custodial tasks.

At longer range, all building service staff members might be provided with training in making "homeowner" repairs. However, future plans for training or retraining both school plant operations workers and maintenance mechanics must be coordinated with plans for organizing the delivery of services. It is possible that training a custodial worker in "homeowner" repairs would be the starting point for a career as a maintenance mechanic, building service manager, crew leader, and so on (see Part VI for a discussion of training and promotion in relation to organization of services). This would strengthen MCPS's EEO strategy and program.

Part IV: Energy Management

MCPS Energy Program (Ch.18)

Two individuals in the Department of School Services are responsible for all activities required for the entire MCPS energy management program. The number and variety of tasks and the importance of energy management to MCPS are such that this level of staffing is inadequate.

During recent years, there has been a decrease in MCPS in the use of natural gas, fuel oil, water, and electricity, but telephone costs have increased by 54 percent. The energy management staff report that the present monthly and annual energy consumption and cost data are difficult to interpret, out of date when they are received, and frequently inaccurate.

Recommendations: (1) Establish an energy analysis and monitoring division with adequate staff and computer support. (2) Involve principals, other unit managers, accounting staff, and computer staff in a search for better ways to monitor and evaluate the energy program. (3) Develop guidelines for interpretation and use of utility data and review them annually with managers of each facility. (4) Institute direct budgeting for telephones.

Energy Auditing (Ch.19)

At present, MCPS does not have sufficient data on which to base an energy management plan, despite the fact that it has been shown that savings of 20-30 percent can be achieved through energy auditing. Several years ago, the two people assigned to energy management conducted about 240 audits in six months, but because staff and time were limited, the audits were not performed in the detail needed to yield complete and reliable data. Sound and reliable energy audits are essential to the development of an overall energy saving plan for MCPS generally and for each individual school. In some schools, energy audits should be the primary means of reducing energy consumption.

Recommendations: (1) Staff and funds should be allocated to a new Energy Analysis and Monitoring division to conduct comprehensive energy audits of each MCPS facility. (2) A comprehensive energy plan should be developed on the basis of the audits.

Computer Control (Ch.20)

In FY 1978, a computerized system to control heating, ventilating, and air conditioning equipment was installed in five MCPS secondary schools. While all secondary schools reduced energy consumption in FY 1979, the five schools on the computer system did so to a far greater extent than the other schools. It is estimated that if computer controls were installed in all secondary and air conditioned elementary schools, installation costs would be paid back in less than two years. By the third year, savings would exceed annual management costs by $1,366,928. However, it should be remembered that substantial reductions in energy consumption and costs can be realized through energy audits.

Recommendations: (1) If justified by energy audits, all secondary schools and air conditioned elementary schools should be put on a computer controlled energy management system. (2) The energy management staff should determine the optimal installation time and payback period for MCPS as a whole and for individual facilities.

Natural Gas (Ch. 21)

During recent years, natural gas has become much less expensive than fuel oil, and savings can be achieved if gas can replace fuel oil in a large number of schools. To obtain an estimate of savings, the cost of fuel in three MCPS elementary schools that used only natural gas was compared to the cost in three elementary schools of the same size that used only fuel oil. The cost of fuel in the schools using natural gas was only 65 percent of the cost in those using fuel oil. If the difference between the cost of natural gas and fuel oil continues in the future, it is estimated that total savings in MCPS could be $1,663,214 annually. The cost for converting 137 elementary schools to natural gas would be paid back in 2.5 to 6.2 years, in secondary schools in 1.0 to 2.5 years, and at the central office in 2.6 to 6.5 years. According to national statistics, there is apparently good reason to assume both continued cost advantages and long-term availability of natural gas.

Recommendations: (1) A cost-benefit study should be conducted to determine installation costs and potential savings involved in converting to natural gas. (2) A formal request should be made to the Washington Gas Light Company for information about availability of gas lines and connection charges, and a schedule for making large scale conversion should be requested if warranted. (3) If it is determined that it is desirable, prepare a detailed proposal for conversion.

Part V: Overview of Central Management

Management Model (Ch.22)

The project staff in the Department of Educational Accountabilty adopted for this study a simplified model which divides managerial responsibility into three categories. Strategic planning includes setting objectives, establishing procedures for meeting objectives, and planning for the acquisition and distribution of resources. Resource control involves using resources effectively and efficiently and matching outcomes of resource distribution to objectives established by strategic planning. Operations control includes assigning work, supervising jobs and workers, and carrying out inspections to assure that functional tasks are performed effectively and efficiently.

Central Management: Findings and Recommendations (Ch.23)

Findings presented in Parts II and III show that in both the Maintenance Division and School Plant Operations there are severe deficiencies in all three management responsibilities. There is no overall planning process, and little of the planning that does take place is based on accurate data collected from resource and operations control. Inspections of work are limited, and controls over supplies and materials are lax or nonexistent. Standards of most kinds either do not exist or are so affected by outside factors as to be meaningless. Units which should work in cooperation tend to be separated, and functions which should form a continuum are divided among units. This is particularly true of maintenance and school plant operations functions. Therefore, during a time when MCPS is adjusting to diminishing resources, new management structures and procedures must be created for the service functions of the school system.

It is recommended that a new Department of Facilities Management be created. The new department should include three divisions: (1) a new Division of Maintenance and Operations, (2) a new Division of Energy Analysis and Monitoring, and (3) the extant Division of Capital Projects and Construction. The Division of Maintenance and Operations would combine the two existing functions of maintenance and school plant operations. The Division of Energy Analysis and Monitoring would increase the importance and visibility of the present energy management staff and function. The Division of Capital Projects and Construction is included in the new department because it is clear that facilities management and capital projects are not easily separated and that maintenance, operations, and energy management staff must have a larger voice in planning capital projects.

All current functions of the present Department of School Facilities would be incorporated into the new Department of Facilities Management. Current school plant operations functions and energy management would be transferred from the Department of School Services, but other current functions of School Services would remain in that department

Unless and until the new units are formed and functioning, it would be difficult or impossible to carry out many of the recommendations made in Parts II, III, and IV. It is therefore recommended that only central management be reorganized at this time (not the delivery of services). Management theory predicts that improved efficiency results from increased planning, supervision, and control. If only a one percent savings in maintenance and operations functions were realized annually, it would amount to $250,000 (based on FY 1981 figures). A five percent savings--which is not unreasonable according to the literature of the field--would amount to $1,130,110

Recommendations: (1) Implement the new management structure and identify quarterly dates for completion of individual goals over the next three to four years. (2) Develop and implement a comprehensive planning process for facilities management. (3) Begin collecting data on current tasks. (4) Complete the energy management plan and begin its implementation. (5) Establish controls and accountability procedures throughout units of the new department. (6) Investigate alternative structures for the delivery of unified maintenance-operations services.

Part VI: Alternatives for the Delivery of Service

Alternatives (Ch.24)

Until the new Department of Facilities Management is established and given time to address immediate areas of concern, it would be premature to recommend any new strategy for the merged delivery of maintenance and operations services. However, at some time in the future, it is probable that services will be merged to reflect the fact that maintenance and operations functions represent a continuum of service.

Three possible alternatives for the unified delivery of services were discussed by various managers in the course of this study and are presented here for future consideration. One is to convert a certain number of maintenance positions and virtually all building service positions to school-based maintenance-operations positions, increasing the number of workers at each school; a central maintenance shop would provide major services to all schools in the county. Another alternative is to reduce the in-school staff to a minimum and form roving general maintenance crews made up of maintenance mechanics and building service workers; each crew would be assigned to a group of schools, and maintenance vehicles would provide shop facilities at the work site. Finally, in a cluster plan, each school would be assigned to a geographic cluster; existing operations staff and selected maintenance mechanics would be divided among clusters, and only a minimum staff would remain in each school to do housekeeping and operate plant equipment.

It is probable that some savings would be realized through reorganization of the delivery of services. While no one plan can be recommended over another, a preliminary cost analysis was made of the cluster plan because it represents the greatest change from current practice. It is estimated that there could be a saving of $183,476 per annum in school plant operations staffing. Savings, (if any) in maintenance staffing could not be estimated, because it cannot be known at present which mechanics would be assigned to clusters and which to a central shop.

Recommendations: (1) Implement the merger of units at the central office level (but not in the delivery of services) and implement operational recommendations made in Parts II, III, and IV as soon as possible and feasible. (2) Complete the decentralization of maintenance functions. (3) Pilot a school-based maintenance plan, collect and analyze data, and pilot other projects as more information becomes available.

Training and Promotion (Ch.25)

No long-range recommendations can be made for training maintenance and operations staff members because training and promotion are so closely related to how the delivery of unified maintenance-operations service is ultimately organized. Therefore, as managers of a new department and division study alternatives for organizing the delivery of service, they must also consider what training will be needed by workers and what implications there are for promotional opportunities.

The long-range problem for managers will be to devise training programs that support a new mode of organizing service, meet the needs of MCPS, and meet individual human needs. Training maintenance mechanics and some building service managers and plant equipment operators should present the fewest technical problems. Integrating the present building service workers through training into a unified maintenance-operations delivery system will present the greatest challenge. Some building service workers are already prepared for additional training, while others will need more general education courses before they can take advantage of advanced training. What will be important will be to make training opportunities equally available to all workers regardless of the level at which the individual enters the system.

The same principle must guide the development of career and promotional opportunities, which must also be equally available to all workers. This means that in any new unified division there should be a single promotional "tree" with "career branches" that lead to advanced positions.

REPORT ON THE MAINTENANCE DIVISION AND SCHOOL PLANT OPERATIONS

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ACKNOWLEDGEMENTS

Thanks are extended to the following individuals and groups who contributed in major ways to this project:

Mrs. Judy Swift, Mrs. Louise Nichols, Mrs. Francys Richardson, and all of the other secretaries and clerks in the Department of Educational Accountability who saw this report through from its rough beginnings to the final printed form.

The many supportive services and professional staff members in the Office of the Associate Superintendent for Supportive Services and particularly in the Department of School Facilities and the Department of School Services. These busy people graciously searched for and provided the project staff with documents and took the time to answer many questions large and small.

The principals, teachers, school plant operations staff, and maintenance mechanics who responded to questionnaires in such large and gratifying numbers.

The managers and supervisors of the Department of School Facilities, the Department of School Services, and of the various divisions of those departments without whose help and cooperation the study could not have been done.

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ORGANIZATION AND OVERVIEW OF THE MAINTENANCE DIVISION AND SCHOOL PLANT OPERATIONS STUDY

Introduction

It is intended that this report be used as a resource document by readers with different interests and needs. Like any conventional report, it can simply be read from beginning to end. The reader can, however, choose to deal with the subject matter of, say, Part III (School Plant Operations) before reading Part II (Division of Maintenance) or may want to follow a particular topic like planning and scheduling of services across Parts II and III. The purpose of this overview, therefore, is to explain the organization of the report and the reasons for that organization so that optimal use can be made of the information presented.

Underlying Considerations

This is a single report of what were originally intended to be two studies, one of the Division of Maintenance, the other of School Plant Operations (a function, not a unit, but referred to as a unit for convenience). In the course of the research, it became obvious that maintenance and school plant operations functions cannot and should not be separated and that there are problems of management which can best be solved by the creation of a single new administrative unit. Therefore, if two separate reports were issued, critical relationships might not be seen clearly and important recommendations for the reorganization of management and the delivery of services might not be fully understood.

Despite the fact that maintenance and school plant operations functions actually represent a continuum of service, there are technical differences between points along that continuum which are currently reflected in separation of functions by unit. There is a difference, for example, between changing a filter on an air conditioner (a School Plant Operations responsibility) and diagnosing and repairing a malfunctioning air conditioner (a Maintenance Division responsibility). The problems involved in providing these different levels of service are just as real and important as the relationships between functions, and they must be dealt with no matter how services are administratively organized and delivered.

These considerations underlie the organization of this report. There is the need to deal with the problems involved in the delivery of different technological levels of service, which means, at present, treating the Division of Maintenance and school plant operations separately (i.e., as two separate studies). There is also the need in this single report to show the relationships among functions, services, problems, and solutions to problems.

Organization of the Report

Part I: Introduction

Part I is an introduction to the Management Operations Review and Evaluation (MORE) concept, particularly in relation to the Maintenance and School Plant Operations study. It includes descriptions of the two units and a discussion of some of the general problems they face in attempting to deliver a full range of maintenance and school plant services. There is a brief description of the methodology employed in the study (see Appendix A for a full description).

Parts II and III: Maintenance and School Plant Operations

Parts II and III are the separate studies. Part II deals with the Division of Maintenance and Part III with School Plant Operations. Chapters and topics within each study correspond to major research topics originally identified and approved. Chapter titles tend to be the same in both studies, though they are not necessarily in the same order. It is therefore possible to follow a particular topic across studies.

The point of view taken in Parts II and III is that given the present organization, the study of the unit is the study of the function. Thus the study of the Maintenance Division reveals problems (and achievements) in organizing and delivering maintenance services which must be dealt with regardless of what decisions may be made about a new administrative unit. The same thing is true, of course, in the study of School Plant Operations.

Part IV: Energy Management

A study of energy management was included under School Plant Operations in the original research design because it is a responsibility of the Department of School Services. It grew into a study in its own right as it became apparent that improvement in the management of energy and utilities could yield major financial benefits. Again the view is taken that energy problems must be solved regardless of admistrative organization.

Part V: Overview of Central Management

Part V summarizes major findings which have broad managerial implications. It then presents a recommendation for the formation of a new administrative unit, the Department of Facilities Management, which would include two new divisions, the Division of Maintenance and Operations and the Division of Energy Analysis and Monitoring.[1] It should be clearly understood that Part V deals only with central management and not also with the organization and delivery of maintenance and school plant operations services.

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[1] The recommendation also includes already existing units in the new department.

One of the most important general findings is that there is a need for an entirely new approach to the coordinated management of maintenance and school plant operations functions. Until and unless there is a new management system and a change in the approach to the management process, it is doubtful that many of the specific recommendations made in Parts II and III will be accepted and acted upon. Therefore, concepts and recommendations discussed in Part V are referred to frequently throughout the rest of the report.

Part VI: Overview of the Delivery of Services

Part VI presents examples of how the future delivery of maintenance and school plant operations services might be organized. Recommendations are made only about issues managers will need to consider, not about specific ways the delivery of service should be organized. There is good reason for this. Parts II and III present the problems that must be solved in delivering services and offer recommendations for solving them. However, the managers of the new department and divisions must make decisions about how to organize the delivery of services so those recommendations can be implemented effectively. Therefore, Part VI presents only some of the alternatives which were discussed by unit managers at one time or another in the course of the research. Specific recommendations at this time would be premature and go beyond any data which were collected.

Part VI also includes a discussion of training and promotion of maintenance and operations staff members. Again, specific recommendations are not made because managers must coordinate training and promotional opportunities with the organization of the delivery of service.

PART I

INTRODUCTION TO THE STUDY

CHAPTER 1

"MORE" AND THE MAINTENANCE DIVISION AND SCHOOL PLANT OPERATIONS STUDY

Management Operations Review and Evaluation

In 1979, the Board of Education of the Montgomery County Public Schools (MCPS) directed the superintendent to undertake a series of studies of all units of the school system except school-based instruction. These Management Operations Review and Evaluation (MORE) studies, conducted by or through the Department of Educational Accountability, will address the following broad questions:

- Can any functions or services of the unit be eliminated?
- Can any functions or services be provided in a more effective or efficient manner?
- Are there ways to assume additional functions or provide additional services without adding new resources or in an otherwise cost effective manner?
- Are the administrative and financial controls by which the unit is managed adequate?
- Have the objectives of the 1978 administrative reorganization been met? (When the question is applicable.)

The delineation of these questions does not mean that MORE studies are restricted to these issues. Rather, many major and subordinate issues may be addressed, and the identification of these issues is one of the important phases of the study.

Maintenance Division and School Plant Operations

Studies of the Maintenance Division and of School Plant Operations were among the first of the MORE studies to be scheduled. The selection of these units was based on a weighting system which took into account the size of the unit's budget, size of the budget by percent of growth, number of staff members, and a final score on a criterion checklist. The relationship between units (or studies) was also a criterion.

Originally, studies of the Maintenance Division and School Plant Operations were conceived of as two separate though overlapping studies. However, so closely related are the functions of the two units that it became apparent that this kind of separation would be artificial. Therefore, one report is issued to cover both units.

CHAPTER 2

GENERAL DESCRIPTION OF THE MAINTENANCE DIVISION AND SCHOOL PLANT OPERATIONS

Introduction

Both the Maintenance Division and School Plant Operations fall under the aegis of the Office of the Associate Superintendent of Supportive Services. Maintenance is a division under the Department of School Facilities. There is nothing corresponding to a division of school plant operations. However, certain administrative functions are carried out by the Department of School Services, which also includes the energy management staff.

Division of Maintenance

The Division of Maintenance is responsible for the maintenance and repair of all buildings, equipment, grounds, and other facilities (playing fields, etc.) operated by MPCS. (There are some exceptions like the maintenance and repair of musical instruments, etc. to be discussed in Part II.) In addition to its managerial and clerical staff, the division employs more than 400 skilled mechanics representing more than 40 trades.

Until 1977, the division operated from a central shop located at the Lincoln Center. In 1977, it was decentralized, and area maintenance depots were established to serve the school administrative areas. A countywide service park is located at Shady Grove Road. It houses the director's office and a central depot which provides certain major services to all schools throughout the county. The central supply for the division, operated by the Division of Supply Management, is also located at the Shady Grove site as is the depot which serves schools in Area 3. The central depot is under the direction of the assistant director of the Division of Maintenance. The other area depots are located at Bethesda (Areas 1 and 4), Clarksburg (Area 5), and Randolph (Area 2). Each area depot is directed by an area supervisor.

Requests for maintenance service are made to the depot serving the facility from which the request originates. Workers are dispatched from the area depot to the job site, and work is performed on site when possible. Work which cannot be done by the area depot staff and certain types of preventive maintenance are done by mechanics from or at the central shop.

School Plant Operations

As used throughout this report, School Plant Operations (or, more simply, Operations) refers to a group of managers and workers who are responsible for the operation of plant equipment and custodial, housekeeping, and related services in schools and other buildings. There is no separate administrative department or division of school plant operations. It must therefore be understood that while Operations is used as if it were a divisional title, it is merely a convenient way of referring to a particular group of MPCS staff members and their functions.

In a sense, Operations falls under the aegis of the Department of School Services, which is responsible for staffing, budgeting, and supply management for the functional group. Five area building service supervisors are assigned to the office of the Director of School Services, though each works out of an area administrative office.

The principal of a school is the manager of building service functions. The director of the Department of School Services and the area building service supervisors are primarily technical consultants and assistants to principals and building service managers.

The vast majority of Operations staff members are based in schools. In each school there is one building manager who is the immediate supervisor of the workers and who, in elementry schools, also operates plant equipment. Custodial and other housekeeping work is performed by building service work leaders and building service workers. A plant equipment operator is assigned to each secondary school.

Energy Management

Energy management is included in this report because it is so closely related to plant equipment operation and is, therefore, a part of Operations as defined here. There are also important relationships between energy management and some of the functions of the Division of Maintenance.

The Department of School Services is responsible for the management of energy and utilities for MCPS as a whole. It establishes policies and procedures, monitors and reports energy consumption, budgets for energy and utilities, and disburses funds. The energy staff consists of two persons assigned to the director's office.

Each principal is required to appoint an individual to serve as energy monitor. The monitor receives reports on the school's use of energy and utilities from the Department of School Services and, as the principal's designee, is responsible for taking appropriate action if the data show consumption guidelines are not being met.

Over the past two years, certain schools have been put on a computer system which monitors and controls the use of electricity and fuel oil. By the end of the current fiscal year, 14 schools will be on the system.

Energy Management was originally included as a part of the School Plant Operations study. It has, however, been given special and separate consideration because of the tremendous importance the whole problem of energy consumption has acquired in recent years.

Methodology

The methodology employed in this study is described in detail in Appendix A. Briefly, at the beginning of the project, a preliminary survey was conducted to help administrators and members of the project staff identify issues to be investigated. After issues had been identified, a data collection plan was developed . Methods of data collection included document analysis, audits, and interviews. In addition, a set of questionnaires was developed and sent to samples of schools, principals, teachers, building service managers, building service workers, and plant equipment operators. Questionnaires were also sent to all mechanics in the Maintenance Division (and therefore sampling was not involved). Samples were selected in such a way as to be representative of all schools (42% included in sample) and/cr teaching and other job assignments. It is important to note here that 93 percent of the sample schools and more than 80 percent of all staff members who were sampled returned questionnaires.

Terminology

Two groups, managers and building service workers, are referred to frequently throughout this report. In the first case, a generic reference is used to maintain the anonymity of respondents; in the other, it is a matter of convenience.

"Managers" almost always refers only to upper echlon administrators of departmental or divisional central offices and does not include area maintenace depot supervisors or area building service supervisors. There are, however, some cases in which these supervisors can speak as managers of a particular function or service and may, therefore, be referred to as managers. In these situations, an effort has been made to make it clear that supervisors are the respondent group. In no case does "manager" or "supervisor" include maintenance mechanics who hold positions with "supervising" as part of the position title (e.g., supervising carpenter).

In reports of questionnaire data, building service workers and plant equipment operators are referred to by the single designation "building service workers." This is done because the same questionnaire was sent to both groups. In all other cases, a single generic term is not used.

Problems Faced by the Units

To read, understand, and interpret this report fairly, it is essential to bear in mind some of the functional and organizational problems faced by the Maintenance Division and School Operations. While some are objectively real and shared by both units, some are matters of perception which affect judgments about one unit or the other.

First, there is the magnitude of the daily workload confronting both units. MCPS operates about 200 mostly large public buildings occupying four square miles and used by more than 100,000 people daily. The variety and amount of equipment is staggering. The Maintenance Division is responsible for keeping all of it in repair or working order. The Operations staff must operate much of the equipment, keep the buildings clean, and perform first echelon maintenance on both buildings and equipment.[1]

The aging of buildings and equipment compounds the problem. In addition, the community use of schools after the regular school day imposes an extra burden on buildings, equipment, and staff. Vandalism has increased over the years, with an increase in costs and work load. Energy conservation, with lower indoor winter temperatures and higher warm weather temperatures, has sometimes created the impression that building service workers and maintenance mechanics are not doing their jobs properly. Closely related is a certain amount of confusion about which unit is responsible for what, and either may be blamed for something done or not done by the other.

There are other problems unique to the individual unit. For example, the decentralization of the Maintenance Division has not been carried out as intended, a fact which has created some management problems. In Operations, there is a problem of central managerial control in the absence of an administrative division. These and other problems are discussed in appropriate places throughout the report.

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[1] First echelon maintenance includes such things as cleaning, waxing, lubricating, changing filters, etc. It may include making minor repairs, but does not include replacement, repair, or other maintenance which requires specialized trade or craft training.

PART II

THE DIVISION OF MAINTENANCE

CHAPTER 3

MAINTENANCE COSTS AND BUDGET

Introduction

The $8,600,000 Maintenance Division budget ranked seventh among the 13 categories of the MCPS operating budget in FY 1980. It was partly because of the size of the budget that the unit was chosen to be one of the first to be studied under the MORE projects.

Findings: Costs and Problems in Determining Costs

Cost Increases

Exhibit 3.1 shows changes in the total MPCS operating budget and in the Division of Maintenance budget from FY 1969 to FY 1980. Both budgets are corrected for inflation. That is, the year FY 1969 was used as a base. All other annual budgets are expressed in 1969 dollars, which means as ratios of the 1969 budget. So, for example, the total MCPS operating budget increased by 1.11 between 1969 and 1970, or the 1970 budget was 1.11 times greater than the 1969 budget in 1969 dollars.[1] The MCPS operating budget in 1971 was 1.19 times greater than the 1969 operating budget in 1969 dollars. In contrast, the 1970 Maintenance Division budget was 1.13 times greater than the 1969 maintenance budget, and the 1971 maintenance budget was 1.24 times greater than the 1969 maintenance budget--both in 1969 dollars.

Both the total operating budget and the Maintenance Division budget increased each year between 1969 and 1975. The Maintenance Division budget increased at a higher rate than did the total budget (except in 1974). The total budget reached a plateau between 1975 and 1977, while the Maintenance Division budget continued to increase between 1975 and 1976. In 1978, both budgets declined (but were still greater than 1969 in 1969 dollars), but the Maintenance Division budget declined at a lower rate than the total budget.

The data show, then, that cost increases for maintenance services have exceeded cost increments in the total operating budget. (This is in keeping with a national trend which has been observed since about 1972.) During the past five years, the number of maintenance workers has decreased by only 5 percent. From FY 1975 to FY 1980, however, enrollment dropped 18 percent, and between FY 1975 and FY 1979, the number of schools in operation decreased by 9 percent.[2]

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[1] Therefore, if a service or function cost $1,000,000 in 1969, the same service or function would have cost $1,110,000 in 1970--in 1969 dollars.

Maintenance and Capital Projects

Several years ago, the Montgomery County Council established 26 renovation and remodeling positions in the Division of Maintenance operating budget and funded them from the capital projects budget. However, all work on capital projects is not performed by these 26 workers, nor do these workers always work on capital projects (though about 95% of their time goes to capital projects). Instead, there is a kind of exchange of labor in which other maintenance workers may perform some capital projects tasks, and the renovation-remodeling crew may perform regular maintenance work (about 5% of their time). Labor, overhead, and supplies for capital projects are charged back to the capital projects budget by the Maintenance Division.

According to department and division administrators, this exchange between capital projects and regular maintenance results in the delay of preventive and routine maintenance. Therefore, some solution must be found to reduce both the budgetary and work-related problems caused by the present allocation of funds and staff.

Maintenance in Other Budgets

It is difficult to obtain a true picture of total maintenance costs, partly because some are budgeted outside the state category (08) for maintenance. For example, the maintenance and repair of musical instruments is in the instructional budget. The maintenance and repair (with some exceptions) of the transportation fleet is in the budget of the Department of School Services. The actual overall costs of maintenance in MCPS are, therefore, considerably higher than those given previously. In fact some of the apparent recent decline in the Maintenance Division's budget may be accounted for by how money has been budgeted rather than by how it has actually been spent.

Unrecovered Costs

Some expenditures by the Division of Maintenance which cloud the cost picture involve code compliance, joint occupancy, school closings, and vandalism. Fire, sanitary, other health, and safety codes are sometimes introduced or

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[2] This comparison does not imply that enrollment should be a standard for staffing.

Exhibit 3.1

FY 1970- FY 1980 OPERATING AND MAINTENANCE BUDGETS EXPRESSED AS RATIOS OF THE FY 1969 BUDGET[a]

Fiscal Year	Total Operating Budget	Maintenance Budget
1980	1.25	1.28
1979	1.32	1.36
1978	1.37	1.42
1977	1.38	1.46
1976	1.38	1.47
1975	1.38	1.44
1974	1.37	1.36
1973	1.36	1.48
1972	1.26	1.34
1971	1.19	1.24
1970	1.11	1.13
1969	1.00	1.00

---

[a] Corrected for inflation on the basis of the Consumer Price Index. The year 1969 is taken as the base year and is therefore 1.00.

changed, and facilities must be modified in accordance with them. Since the work is largely maintenance work, it is performed by mechanics of the Maintenance Division. Despite the fact that codes are imposed by external agencies, there is no recovery of the costs of performing the work. Actual costs for code compliance are not known by the division managers.

Repair and maintenance costs are included in fees charged for community use of schools and joint occupancy. Some of these costs are partially recovered by MCPS. However, they are returned to the general fund, not to the Maintenance Division which performs the maintenance and repairs.

The Maintenance Division continues to be responsible for repairs between the time a school is closed and the time it is turned over to the county government.[3] If work must be done, it could be looked at as an "unrecovered" cost since MCPS will no longer derive benefit from the facility.

Finally, it is estimated that vandalism costs MPCS between $400,000-$500,000 a year. It is said that this estimate is conservative because not all cases of vandalism are reported. It is possible, according to unit managers, that as much as 30 percent of the Maintenance Division budget is spent on repairs necessitated by vandalism.

Findings: Budget Planning

For approximately the past ten years, the Maintenance Division budget has not been based on an assessment of actual maintenance needs. Instead, administrators at all levels have had to make budget estimates on the basis of experience, past budgetary history, and "what the traffic will bear." There have been little or no data (except past budget history) on which to base estimates or justify expenditures. For example, there are no data which show how many maintenance mechanics are needed overall or what the mix of mechanics should be. Decisions to add or delete positions are based on the director's first-hand knowledge of what is happening in the division and in MCPS generally.

Very late in the FY 1980 school year, a new planning system was adopted and implemented. It is too soon to be able to tell if it will lead to adequate budget planning (see Chapter 8 for a discussion of the new plan).

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[3] From about June 20 to July 1.

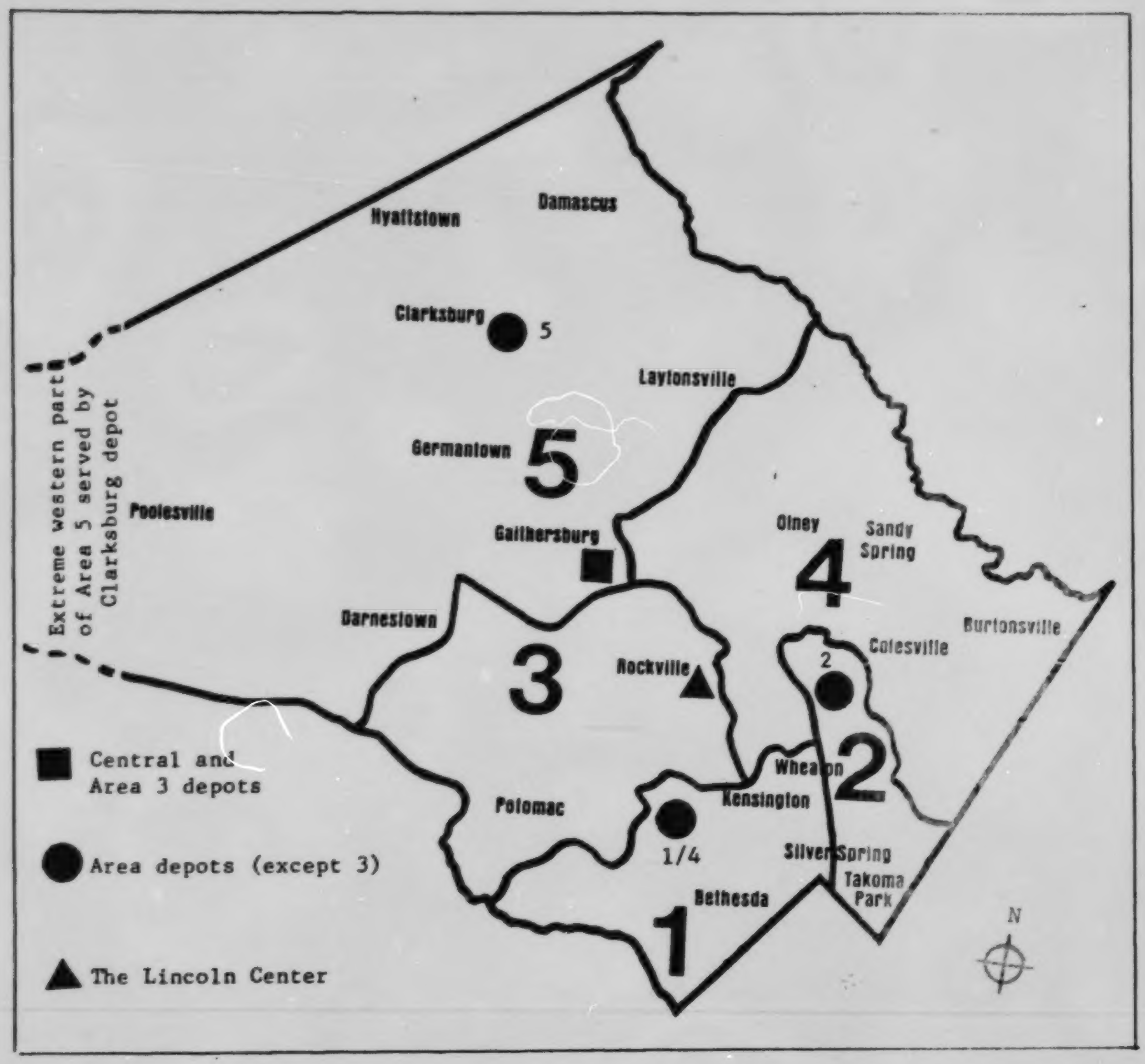
Recommendations

The findings presented here suggest strongly that the following should be done to improve planning and budgeting for the delivery of maintenance services:

- Determine and budget for maintenance needs of MCPS.
  - Analyze true maintenance costs, including the costs of maintenance projects which have been deferred in the past.
  - Restore all appropriate items to the maintenance budget.
  - Re-examine alternative approaches to meeting maintenance needs.
  - Develop a budget planning system based on data on actual and projected needs.
- Keep the maintenance and the capital budgets conceptually separate.
  - Clearly define maintenance and capital projects responsibilities.
  - Provide complete accounting for staff time and supplies when and if maintenance personnel and supplies are used on capital projects.
- Consider separating building and grounds maintenance and instructional maintenance for budgetary purposes.
- Place all appropriate items in category 08 (and also remove inappropriate items) and provide further breakdowns of budget categories.
- Reimburse the division for the expenditures for maintenance and repairs made necessary by the joint occupancy and community use of facilities.

Exhibit 4.1

LOCATION OF MAINTENANCE DEPOTS AND THE LINCOLN CENTER


Hyattstown
Damascus
Clarksburg
5
Laytonsville
Germantown
5
Extreme western part of Area 5 served by Clarksburg depot
Poolesville
Gaithersburg
Olney
Sandy Spring
4
Darnestown
Burtonsville
Colesville
2
3
Rockville
2
Wheaton
Kensington
Potomac
1/4
Silver Spring
Takoma Park
Bethesda
1
N
■ Central and Area 3 depots
● Area depots (except 3)
▲ The Lincoln Center

CHAPTER 4

DECENTRALIZATION OF THE MAINTENANCE DIVISION

Introduction

Decentralization of the Maintenance Division was justified primarily by financial considerations. The following benefits were anticipated from the establishment of area depots:[1]

- Reduction in the number of miles travelled per day and of the time workers would lose en route to and from schools
- A saving of about 82,500 work hours per year (the equivalent of a gain of about 40 workers)
- Reduction of the backlog of maintenance work and improvement in the level of preventive maintenance repairs
- Meeting an increase in requests for service without corresponding increase in staff.

Decentralization began in 1977 when 70 staff members were assigned to the Bethesda depot and 35 to the Clarksburg depot.

Findings

Depots and Areas Assigned

Before decentralization, all maintenance operations were conducted out of or at the Lincoln Center. The central depot, which renders countywide services, is now about three miles northwest of its previous location. It is still more or less centrally located geographically, but is farther from major population centers. (See Exhibit 4.1 for all depot locations.)

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[1] Budget Questions and Answers, Question 111, April 20, 1977, p. 230 f.

Exhibit 4.2

MILES TRAVELLED PER YEAR BY MAINTENANCE TRUCKS FROM FY 1975 TO FY 1979

Year	Number of Trucks	Total Miles Travelled[a]	Change From Previous Year[a]	Mean Per Truck
FY75	260	1,949,000	(Base year)	7,496
FY76	260	1,902,000	- 47,000	7,315
FY77[b]	261	1,971,000	+ 69,000	7,552
FY78	261	2,148,000	+177,000	8,230
FY79	261	2,192,000	+ 44,000	8,398

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[a] To nearest 1,000.

[b] FY77 was the first year of decentralization.

Workers in the depots serving Areas 1 and 2 are now closer to the schools they serve than when they worked out of the Lincoln Center. The situation in other depots and areas is generally confusing, as shown by the following:

- Area 3 depot is now located in Area 5.
  - It is closer to some of the Area 5 schools in the Gaithersburg area than the Clarksburg depot which serves those schools.
  - It is closer to some of the Area 4 schools than is the Area 4 depot.
- Area 4 depot is west of Route I-270, but serves the county's easternmost area.
  - Workers must drive past some Area 1 or Area 3 schools to get to the nearest Area 4 schools.
  - The depot is closer to many Area 3 schools than the Area 3 depot.
- The Area 5 depot (Clarksburg) is now closer to "upcounty" schools but much farther from schools in the Gaithersburg area (which are closer to the Area 3 depot than to Clarksburg).

Travel and Time on Job

Decentralization, as it has been carried out to date, has had the precise reverse of its intended beneficial effects. Exhibit 4.2 shows by fiscal year (1975-1979) the number of trucks in the division, the total miles travelled, the change in mileage from the previous year, and the mean miles travelled per truck.[2] Starting in 1977, the first year of decentralization, the number of miles travelled by maintenance trucks has increased each year, as has the mean instance travelled per truck. The average increase was 60,750 miles per year, and in FY 1979, the trucks logged 243,000 miles more than in FY 1975. This, of course, means an increase in all transportation costs.

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[2] Only one truck has been added since 1975. The trucks are replaced on a schedule, and the 1979 fleet was not the same as the 1975 fleet. However, this has absolutely no bearing on the data and the conclusions derived from the data.

Instead of gaining the estimated 82,500 work hours per year (equal to a gain of about 40 workers), the division lost work hours because of an increase in time workers spent on the road. If it takes three hours for one worker to drive 100 miles, the additional 243,000 miles driven in 1979 would have taken 7,290 hours, or an average of 140 hours per week--the equivalent of a reduction of the work force by almost four mechanics.[3] If the intended increase in time on the job was to improve the level of maintenance, it follows that the decrease demonstrated here must have an adverse impact.

Departmental and divisional managers say that the increase in mileage after decentralization is a trade off, i.e., that drivers and trucks no longer sit immobile in the traffic jams that occurred around the Lincoln Center and on Route 355 (losing time but not accumulating mileage). They also say that decentralization has enabled workers to make more frequent visits to schools and that it is this better service which has caused the increase in mileage.

There is some merit in the first argument, and it is possible that some of the increase in mileage, especially in the first year of decentralization, can be explained in that way. This cannot, however, explain the fact that there have been increases in mileage in each subsequent year or that in 1979 workers drove 243,000 miles more than they did in 1975. It is also difficult to understand how driving more miles--individually or in groups--can result in an increase in time on the job.

The Supply Problem

When the division was decentralized, its central supply, operated by Supply Management, was located at the Shady Grove site. The original plan was to have central supply deliver equipment and supplies to work sites or to the area depots (which do not have stock rooms). The system was never initiated, however. Therefore, workers must drive from either the depot or the work site to central supply to obtain parts, equipment, or supplies. The only alternative is to purchase them from a local vendor if there is one nearby. This alone could be responsible for a large part of the increase in mileage. (See next chapter for discussion of supplies and equipment.)

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[3] This is an extremely conservative estimate which allows only for continuous driving with no delays, stops to perform work, etc. It also assumes only one mechanic per vehicle. The actual loss of work hours would be drastically increased by slower driving time and more workers per vehicle.

Supervision

Before decentralization, according to department and division managers, supervision was centralized and carried out by trade or crew (see Chapter 7). It was said that this is no longer possible and that area depot supervisors are not able to carry out inspections of jobs (but it is claimed that someone is always in charge of any given job) There has, therefore, been a loss of daily supervision by midlevel managers or supervisors.

Working Relationships

It is possible that decentralization has improved working relationships among the Maintenance Division central office, area associate superintendents, depots, and schools. Area depot supervisors say that dealing with one area associate superintendent rather than with several (as was necessary previously) makes it easier to identify needs and problems and to follow up on the progress of jobs.

Questionnaire Results

Exhibit 4.3 shows responses of principals, teachers, and maintenance workers to items dealing with decentralization (by percentages responding in given ways). A majority of maintenance mechanics (64%) said it has been easier to do their work since decentralization, but there was little agreement on other issues. Though it is not shown in the exhibit, the percentages of workers giving favorable responses to all items were greatest in Areas 1, 2, and 5, the ones in which workers are now closer to schools they serve than they were before.

Overall, the data do not support the view that decentralization has improved either the delivery or quality of maintenance service. Fifty-nine percent of the principals said the delivery of service has stayed the same or gotten worse since decentralization, and 70 percent said the quality has stayed the same or gotten worse. Sixty-seven percent of the teachers said service has remained the same or gotten worse.

Implications of the Findings

Under present circumstances, improvement of the decentralization plan cannot be expected unless major changes are made. There must be new depot assignments, either by area or geography. The supply problem is a major one, and few improvements will be realized until it is solved. However, it is shown elsewhere in this report that maintenance mechanics often do not know enough about jobs on which they are sent to know what tools, equipment, or supplies they will need. Any improvement in the supply system could be negated if this were to continue to be true.

Exhibit 4.3

RESPONSES TO QUESTIONS ABOUT DECENTRALIZATION

Respondents/Question	Improved	Same	Worse	Cannot Judge	No Response
PRINCIPALS					
Since Maintenance moved from one central depot to area depots, what has happened to					
The quality of service?	12%	59%	11%	15%	3%
The delivery of service?	25%	45%	14%	12%	5%
TEACHERS					
How, if at all, has the quality of Maintenance service changed during the past three years?	14%	52%	15%	18%	0%
MAINTENANCE WORKERS	Yes	No			No Response
(Since) maintenance moved from one central depot to area depots:					
Is it easier to do your work?	64%	33%			3%
Are you able to complete more jobs each day?	53%	45%			2%
Are you able to get supplies and tools more easily?	48%	50%			2%
Has maintenance service improved?	53%	43%			3%

Rounding error= +/- 2%

Recommendations

- o. Depot responsibility must be reassigned.
    - . While alternatives are being investigated, responsibilities should be exchanged between depots serving Areas 3 and 4. (Or if the number of administrative areas is changed, reassign responsibiities in such a way as to reduce travel time between depot and area until the recommendation which follows can be implemented.)
    - . At longer range, alternative assignments should be investigated: geographic area, population cluster, etc.
- o Make an immediate effort to reduce the number of staff members and vehicles making trips to Shady Grove central supply (see the next chapter for recommendations for improving the supply system).
- o Increase the depot management-supervisory staff (see chapter on management and supervision for specific recommendations).
- o Improve the job information system regardless of what decisions are made about area assignments or supply (see chapters on management, planning, and delivery of service).

CHAPTER 5

SUPPLIES AND EQUIPMENT

Introduction

It was pointed out in the previous chapter that the supply problem is a major one in the effective decentralization of the Maintenance Division. Actually, there are more general problems which range from planning to the procurement and availability of supplies and equipment. They are problems which will have to be solved in the future regardless of how the delivery of maintenance services is organized.

Findings: Planning, Procurement, Control, and Availability

Introduction

It is assumed that planning for supplies and equipment should be based on actual maintenance requirements and on data which justify the purchase of supplies and equipment to meet those requirements. Procurement should involve pretesting of products, the purchase of appropriate and up-to-date products, and volume buying. Supplies and equipment should be controlled so the items purchased are used as intended. And finally, the supply distribution system should enable maintenance mechanics to spend their time on the job instead of driving around to obtain supplies.

Planning

As will be shown in Chapter 8, Maintenance Division supply and equipment needs are not planned in advance on the basis of data which show actual MCPS requirements. The work order system does not supply useful data about supply and equipment needs or costs. Budgeting for supplies and equipment is largely a matter of meeting spending guidelines, not meeting actual needs.

Procurement

There is almost no pretesting of the $900,000 worth of supplies and equipment purchased by the division (FY 1980 figures). The Division of Procurement does no pretesting, and units placing orders are assumed to do their own. Few companies from which purchases are made supply samples of products for pretesting. Area maintenance supervisors are sometimes asked to be responsible for purchases and may write product specifications and examine bids.

Inappropriate or obsolete supplies are sometimes re-ordered. Unsuitable products may be returned (if they are not inadvertently used), but this causes a delay of work.

Volume Buying

There are 1,400 items stocked at the warehouse, and because there is insufficient space the collection cannot be expanded. Therefore, volume buying is now possible for only about 33 percent of maintenance purchases each year. Supplies which cannot be stocked are purchased from local vendors.

Supply Control

All Maintenance Division managers and supervisors say there are no independent controls on the use of supplies. Mechanics can order supplies for a given job from the warehouse or make purchases from local vendors on blanket purchase orders. They are supposed to account for purchases on job work orders. However, there is no control that assures the supplies will be used on the job for which they were ordered--or on any job. In addition, supplies are exchanged among workers and trucks with no accounting to show where they are eventually used. This overall lack of accounting and accountability creates a situation in which abuses are almost encouraged.

Findings: Supplies and Decentralization

It has already been mentioned (Chapter 4) that decentralization of the Maintenance Division is not working as intended, at least partly because of the supply problem. The central supply for the division is at the Maintenance Service Park at Shady Grove Road, and the original plan to deliver supplies and equipment to depots or work sites was never initiated. Area depots do not have a ready source of stock except the small amount which can be kept on maintenance trucks. Workers must drive from the depot or the work site to central supply to obtain parts, supplies, or equipment, or must purchase them from a nearby supplier (if there is one nearby). This offsets many of the advantages which should be realized from decentralization, especially in the areas farthest from Rockville where decentralization should have had the most beneficial effect.

The problem does not lend itself to easy solution at the present time. Area depot supervisors say it would be helpful to have a small supply room at each depot. However, they say there is not enough room and that in any case the Supply Division discourages stocking materials which have a long shelf life. Finally, they say the original plan to have supplies delivered to depots or work sites may not be practical because it is difficult and time consuming to try to coordinate delivery with the dates work will be performed.

Implications of the Findings

An overall, realistic planning system is badly needed to assure that the equipment and supplies purchased are those actually needed to carry out maintenance functions. Pretesting of products and continuous "spot testing" should be an important part of the procurement system. An improvement in planning should make it possible to identify items which are now frequently purchased from local vendors and which could be stocked by central supply. It is estimated by Maintenance Division managers that local purchases could be reduced by 70 percent if there were greater variety in the warehouse stock. All improvements in planning and purchasing could be offset if adequate controls and accountability procedures are not developed, however, and their development should have high priority regardless of what else is done. Maintenance Division managers suggest that a supply unit should be set up at each area maintenance depot under the control of the Supply Management Division. Again, however, advantages can be offset if other changes are not instituted. There must, for example, be some system for obtaining more information in advance about the tools, supplies, and equipment needed for jobs so that workers do not have to spend time going back and forth between the job site and the supply depot.

Recommendations

The following are suggested by the findings:

- A planning system which permits identification of supplies and equipment actually needed for maintenance of MCPS facilities should be instituted.
- A pretesting program and a program for continuous testing of products must be developed and implemented.
- Consideration should be given to increasing the variety of warehouse stock (and volume buying) to include products now purchased from local vendors.
    - If possible, a cost analysis should be conducted to compare all costs of some selected items which are purchased through Procurement (including handling, storage, distribution, etc.).
    - Alternative methods of warehousing and distributing a larger number of items should be investigated (e.g., slow-moving items at central supply, fast-moving items at area depots).
    - It should be made possible for each area depot to stock an inventory that can fill 70 percent to 80 percent of the normal supply and equipment needs.
    - A delivery schedule for the remaining supplies should be set up so that each area receives a delivery not more than twice a day.
- An accounting and accountability system must be developed and implemented to cover all supplies and equipment and their actual use.
- A job-information system must be developed and implemented to reduce the number of trips workers make between schools and supply depots.
- A cost-effectiveness study should be conducted to evaluate the advantages and disadvantages of establishing area supply depots.

Exhibit 6.1

NUMBER OF MAINTENANCE MECHANICS BY LOCATION FY 1980

	DEPOT						
SHOP[a]	1	2	3	4	5	Central	Total
Carpentry	8	10	9	9	8	30	74
Electrical	4	5	5	4	5	1	24
Plumbing	3	4	3	3	3	-	16
Shade	2	2	2	2	1	5	14
General Maintenance	16	15	14	15	12	22	94
Electronics	3	3	2	3	3	18	32
AC/Refrigeration	4	3	4	3	3	1	17
Painting	-	-	-	-	-	44	44
Oil Burner	-	-	-	-	-	25	25
Industrial Equipment	-	-	-	-	-	6	6
Boiler	-	-	-	-	-	12	12
Office Machine Repair	-	-	-	-	-	10	10
Roofing/Sheet Metal	-	-	-	-	-	19	19
TOTALS	39	42	39	39	35	193	387

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[a] A given shop may include mechanics whose trades are different than the name of the shop. For example, the carpentry shop includes glaziers, masons, welders, etc. Some shops, however, do not include subcategories of mechanics.

CHAPTER 6

STAFFING OF THE MAINTENANCE DIVISION

Introduction

Staffing is a major cost of this very large division, and the number and type of staff members affects management and the delivery of service. It was originally assumed it would be possible to derive a considerable amount of information about staffing from the division's work orders. However, the work order system could not provide the data needed to determine the frequency of demand for each type of trade or service or to compare demand frequency with the number of mechanics in that trade. The division could not provide the information from other sources. Therefore, the findings presented here are primarily descriptive rather than analytical.

Findings: Staffing and Comparison With Other Counties

Division Managerial Staff

The central office staff of the division consists of one director, one assistant director, one secretary, one clerk typist, and two account clerks. The assistant director also serves as the supervisor of the central depot. Strictly speaking, there are no other managers in the division. Area depot supervisors do not have control over funds. They have only limited control over the workers assigned to them because they cannot get into the field regularly. Supervisors do not have management assistants, and only a single clerk-typist is assigned to each depot. In each trade and/or shop there are mechanics whose titles include the word supervising (e.g., supervising carpenter), but these are working positions which do not include managerial responsibilities.

Maintenance Mechanics

Exhibit 6.1 shows for FY 1980 the number of mechanics by shop/trade and by depot. A given shop may include mechanics whose trades are different than the name of the shop (though this is not always true), which is what accounts for what may look like an excessively large number of carpenters.

The distribution of workers cannot be compared to the distribution of demand for service. It is for this reason it was said in the chapter on costs and budget that there are no data which justify positions to be budgeted.

Comparison With Other Counties

Exhibit 6.2 shows the number of maintenance workers employed in FY 1980 by MCPS and nearby school systems of similar size. Comparisons are a bit difficult because budgets differ from county to county and job titles differ

Exhibit 6.2

NUMBER OF MAINTENANCE WORKERS BY COUNTY: FY 1980

County	Number School	Number Worker[a]	Mean Number Workers/School
Montgomery	187	388	2.07
Baltimore	147	170[b]	1.16
Prince George's	205	343	1.67
Fairfax	177	500	2.82

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[a] An attempt has been made to include only maintenance workers, but it should be understood that budgets do not always show categories of workers in the same way from county to county.

[b] The MCPS Division of Maintenance takes care of grounds. Baltimore County has a grounds crew of about 100 workers which is not included in its maintenance budget and, therefore, is not included here. If it were included, however, the mean number of "maintenance" staff per school in Baltimore County would be 1.85, or still less than the 2.07 in MCPS.

even more (though an attempt was made to include only maintenance workers). It should be noted that in Baltimore County a grounds crew of 102 workers is not included in the maintenance budget, and much of the maintenance work is contracted out.

Exhibit 6.3 shows comparative staffing by county for FY 1980 broken down by trade and/or shop (this time the Baltimore County grounds crew is included). Differences are more striking in staffing patterns than in numbers of workers. In MCPS, the group of specialists (beginning with electricians, plumbers, etc.) represents 222 workers or 57 percent of the total. Those in the general maintenance shop represent 92 workers and only 24 percent of the total. In Prince George's County, where staffing most closely approximates that of MCPS, there are only 105 workers, or 31 percent of the total, in the specialized group, and 184, or 54 percent, in the general maintenance category. Fairfax County, which has the most workers, has the fewest specialists so far as can be determined from the budget. The trend, then is for MCPS to have a comparatively high percentage of specialists and a smaller percentage of general maintenance mechanics than other nearby school systems.

Findings: Supervisor Ratio

Exhibit 6.4 shows the number of workers supervised by one working supervisor (the 1 is omitted because it is a constant in an x:1 ratio). However, there is a problem in interpreting the data because supervisory responsibilities change from time to time and job to job. The data are therefore presented in three ways as follows:

- By Craft. The number of workers in a given craft divided by the number of supervising positions in the same craft
- By Area. The ratio is based on the distribution of workers and supervising mechanics in all area depots taken together.
- By Budget. The MCPS budget lists workers by type under supervisory categories. The ratio is based on this distribution.

It is difficult to know which of these ratios most closely approaches the reality of actual working conditions. It is clear, however, that there are major disparities in the number of workers supervised by a single supervisor. The range is approximately from 4:1 to as high as 43:1.

The data do not show that there are or are not an adequate number of supervisors or supervising mechanics. However, it does appear that the distribution of supervisors may not be optimal and that they may not be utilized effectively.

Exhibit 6.3

COMPARATIVE MAINTENANCE
STAFFING BY COUNTY
FY 1980

Shop/Trade	Montgomery	Baltimore	Prince George's	Fairfax
CARPENTRY SHOP				
Carpenter	49	10	34	
Glazier	10		11	
Mason	4		3	
Welder	4		4	
Floor Maintenance	7	8		
Time Maintenance		8		
Total Carpentry Shop	74	26	54	177
GENERAL MAINTENANCE SHOP				
Foreman			35	
Laborer			29	
Grounds Crew		102[b]	3	
Chauffer/Driver		21	22	
Equipment Operator	6		24	
Equipment Mechanic			21	
Total General Maintenance	92	151	184	
Electrician	28	19	27	
Plumber	20	14	29	
Painter	44	35	17	
Electronics	32	9	19	
Shade	14			
Heating Mechanic	22			
Boiler Mechanic	9			
AC/Refrigeration Mechanic	19			
Office Machine Repair	10			
Roofing/Sheet Metal	19		8	
Industrial Equipment Mechanic	5			
Stock/Supply Keeper		16		
Surveyor			1	
Cement Finisher			4	
TOTALS	388	272	343	500

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[a] To whatever extent possible, classifications are matched to those used in MCPS. Carpentry and General Maintenance shops subsume the indented categories. In other cases, the trade and the name of the shop may be the same.

[b] In Baltimore County, the grounds crew is not included in the Maintenance Division, but is included here for comparison.

Exhibit 6.4

NUMBER OF MAINTENANCE WORKERS ASSIGNED TO ONE SUPERVISOR BY CRAFT, AREA, AND BUDGET FY 1980

Shop	By Craft[a]	By Area[b]	By Budget[c]
Carpentry	18	31	36
Electical	27	23	27
Plumbing	19	16	19
Shade	13	13	13
Painting	42	43	43
General Maintenance	8	14	12
Heating	18	24	21
AC/Refrigeration	17	21	18
Electronics	15	15	15
Office Machine Repair	9	9	9
Roofing/Sheet Metal	18	18	18
Boiler Mechanics	8	11	8
Industrial Equipment	4	5	4
Other	56	10	-

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[a] By craft: based on the number of workers in a given craft and the number of supervising workers of the same craft. For example, there are 18 carpenters per supervising carpenter.

[b] By area: based on the distribution of workers by depot area.

[c] By budget: based on budget categories, i.e. number and type of workers listed under supervisory categories.

Findings: Over- or Understaffing

General Trends

The Maintenance Division has escaped some of the cuts in staffing which have been experienced in recent years by other MCPS units. In recent years, the division's staff has been reduced by only 5 percent, while enrollment has decreased by 18 percent, and 9 percent of the schools have been closed. However, in the past five years approximately $33-million was spent for additions to or renovations of existing facilities. This may have increased the maintenance work load. Also, buildings and equipment have aged during the same period, and it is reasonable to assume they require more maintenance. It would therefore go badly beyond the data to suggest that staffing in the Maintenance Division must always keep pace with decreases in enrollment or budget.

Division Management Staff

There are nearly 400 mechanics in the division, and the divison's budget is one of the largest in MCPS. There are too few managers to deal with such a large work force and budget.

Area supervisors do not have control over funds and only limited control of workers in the field. Each supervisor, however, is responsible for about 40 schools and 40 or more workers. There is no assistant supervisor, and there is only one clerk-typist per depot to handle all telephone contacts with schools and write work orders. Again, there are too few supervisors and too few support staff.

Questionnaire Data

Exhibit 6.5 shows responses of maintenance mechanics, principals, and building service managers to questions that have a bearing on staffing. Most mechanics said they are given work orders daily, and more than half said they do not finish the jobs on the day they are given work orders. However, 65 percent said they are given new work orders daily even though previously assigned work has not been completed (of course, some jobs cannot be completed in a day). Apparently the demand situation changes rapidly, and workers are not able to plan adequately for changes in assignments. This may reflect deficiencies in planning and scheduling work, but may also be caused by emergencies and other unanticipated requests for service. Most mechanics (63%) said they believe there are enough workers in the various trades to get the work done, though 35 percent said this is not true.

Exhibit 6.5

RESPONSES TO QUESTIONS
RELATED TO STAFFING

Respondents/Questions	Responses	
MAINTENANCE MECHANICS	YES	NO
Are you given written work orders or shop tickets telling you what jobs you are to do each day?	66%	32%
Do you usually finish all your daily work orders on the day you're given them?	44%	54%
Do you get new work orders each day even if you haven't finished the ones from the day before?	65%	34%
Are you told of changes in your work schedule in time to make allowances for them?	69%	29%
Do you have enough workers in your craft or trade to get the work done?	63%	35%

	YES		NO	
PRINCIPALS/BUILDING SERVICE MANAGERS	Prin.	BSM	Prin.	BSM
When maintenance workers come to your school are there more workers than appear to be needed to get the job done?	42%	41%	45%	56%

Rounding error= +/- 2% overall. A very small percentage of no-response not reported.

Forty-two percent of the principals and 41 percent of the building service managers said more maintenance workers are sent than appear to be needed to get a job done. (Whether true or not, the belief that it is true is obviously widespread through MCPS.) While this is not in itself evidence that there are more mechanics than are needed, it may reflect the fact that a number of specialized mechanics might be sent to do a job that could be performed by one well-trained general mechanic.[1]

Implications of the Findings

The frequently repeated claim that the Maintenance Division is understaffed is not supported by the data presented here, and no other data could be obtained from the division. There is good reason, however, to believe that the division is undermanaged (see the following chapter), which may be true at least in part because there are too few managers in the division's central office and at the depots. It cannot be said at this time that there are not enough supervising mechanics. It is clear, however, that the division has no standards or guidelines on which to base an adequate supervisor-to-staff balance.

The MCPS maintenance staff is not especially larger than the staffs of nearby school systems of similar size. What is different about the MCPS Maintenance Division is the reliance on trade specialists and what amounts to a kind of trade union approach to the work. This approach to staffing is questionable. First, it commits MCPS to a staffing pattern that may be rooted in the past and inapplicable to the future. Second, costs are increased when several specialists are sent to do a job that might be done by one generalist. Third, it limits the flexibility of the division.

Recommendations

- Increase the number of unit managers and/or assistant managers, including at the depot level.
    - Give depot supervisors increased managerial control and a management assistant.
    - Provide additional secretarial and/or clerical assistance at all levels.

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[1] Schools do not always provide correct information about needed work to the Maintenace Division. This results in sending the "wrong" mechanic or several mechanics to do a job that could be done by one appropriate mechanic if task demands were known.

- o Increase the number of midlevel and job-level managerial and/or supervisory positions, but only after the following have been done:
  - . Guidelines have been developed for supervision and supervisory ratios
  - . A better balance between supervisors and workers has been achieved
  - . An inspection and reporting system has been developed
- o Develop an information system on which sound decisions about staffing and staffing patterns can be based.
- o Investigate the feasibility of reducing the number of trade specialists and increasing the number of general maintenance workers through training and reassignment (while retaining specialized capabilities).

CHAPTER 7

MANAGEMENT, SUPERVISION, AND CONTROL

Introduction

The basic question dealt with here is the extent to which administrators and supervisors of the Division of Maintenance can and do exercise control over the division and the delivery of service. This also involves two subordinate issues: the development and use of work standards and the work order system.

It is assumed here that managerial control involves reasonably frequent contact between managers and workers, active supervision and inspection, and feedback to the employee about the quality of the individual's performance. In some cases, a reporting system is the necessary alternative to immediate supervision and inspection, though it can never be a substitute for either.

Findings: Management Structure

There are clear-cut responsibilities and managerial relationships at the department and division levels. That is, an organizational and managerial system is in place, with appropriate authority and control vested in each manager: the associate superintendent for supportive services, the director of the Department of School Facilities, and the director of the Division of Maintenance.

At the depot level, responsibilities are not quite so clear. In each area depot, the area supervisor is responsible for about 40 workers, and the assistant director of maintenance is responsible for even more at the central shop. While some of the work of the division is performed in the shops, a large part of it is done in the schools by mechanics who are not directly observed by the depot supervisor. At this level, supervisory responsibility is vested in supervising mechanics. It is said by division managers that someone is always in charge of a given job, but mechanics do sometimes go out to jobs on their own. The principal of a school is not a manager of maintenance workers in any sense, though someone at the school is supposed to "sign off" on a work order to show the work has been performed.

The work order itself is one of the primary means of communication within the division and, if properly completed, would contain all basic management information about the job: hours, type and cost of materials, and so on. The work order is used primarily, however, as a means of dispatching mechanics to jobs.

Exhibit 7.1

RESPONSES OF MAINTENANCE MECHANICS AND PRINCIPALS TO QUESTIONS ABOUT SUPERVISION

Respondents and Questions	Responses		
MAINTENANCE MECHANICS	YES	NO	NO RESPONSE
Does your shop supervisor check with you at least once a week to see how your work is going?	72%	27%	1%
Is your work inspected at least once a week?	50%	49%	2%
Do you know when your work will be inspected?	9%	91%	1%
Do you report to your supervisor each day?	86%	14%	
Is it clear to you what your supervisor expects each day?	84%	15%	1%
If you find a problem on a job, do you know to whom to report it?	93%	7%	
Are you generally satisfied with the supervision you get on the job?	78%	22%	

PRINCIPALS	CALLS SCHOOL	ROUTINELY INSPECTS	NO KNOWN PROCEDURE	NO RESPONSE
After maintenance workers have been to your school, what procedure, if any, does the Maintenance Division use to check the adequacy of the work?	5%	11%	74%	11%

Rounding error +/- 2%

See section on work orders for related data.

Findings: Effectiveness of Control

Department of School Facilities

There are indications that managerial control at the department level is not as effective as it might be in terms of the assumptions made in the introduction to the chapter. It was said by some department managers that there is not always effective communication between the department director and the division director. While they maintain frequent daily telephone contact, they do not meet together regularly.

One also gets a feeling of "drift" at the departmental level. It was stated by department managers, for example, that no one made the decision not to start the planned delivery of supplies to work sites or area depots. Rather, it was simply not gotten around to because no one took the initiative to press for a solution to the problem.

In addition, potentially important information is not available at the departmental level. It was not known, for example, that there has been a major and costly increase in the number of miles driven per year by the Maintenance Division since decentralization. Inefficiencies in the work order system (to be discussed later) were also apparently not known.

Maintenance Division: Central Office

Managerial control at the division's central office is also probably not as effective as it might be despite personal strengths of managers. First, there is not an adequate or effective reporting or information system which enables central office managers to check in any way on the delivery of services or the quality of the work performed. An effective work order system would be a means for the central office staff to check on work flow, costs, and many other aspects of the work. However, as will be shown later in this chapter, the work order system provides little or no information.

Depot Level

Depot supervisors do not typically carry out inspections and do not check with principals about the completion and adequacy of work. Exhibit 7.1 shows responses of maintenance mechanics and principals to questionnaire items dealing with inspection and feedback. While many of the mechanics' responses were favorable, it is clear that supervision and inspection are not the norm, since 49 percent of the mechanics said their work is not inspected at least weekly. A large majority of principals (74%) said they know of no procedure in the Maintenance Division for checking on work.

Work Standards

Work standards are written instructions on how to do a job, how long the job should take, and what materials are needed to perform the work. The

Exhibit 7.2

INFORMATION RECORDED ON WORK ORDERS[a]

Information	Recorded On
Date	98%
Name of school	100%
Section (shop) to which job assigned	79%
Clear job description (legible, enough information to be readable; not necessarily an adequate description)	74%
List of purchased materials (not always applicable)	32%
Cost of purchased materials	29%
As a percent of those listing purchased materials	91%
List of materials from division supply (not always applicable)	37%
Cost of materials from division supply	17%
As a percent of those listing such supplies	45%
Total cost of materials (not always applicable)	26%
As percent of orders listing materials	38%
Name of worker(s) performing job	96%
Hours attributed by worker(s) to job	96%
Total hours	20%
Hourly pay rate	7%
Total of hourly rate	1%
Total job cost	8%
Date work begun	50%
Date work completed	50%
Signature of person "signing off" on job	79%

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[a] See Appendix B for a description of the methodology of the audit. The sample on which these percentages are based was random and included all five area depots. It can therefore be reasonably assumed that the percentages reported here for the sample generalize to all work orders.

Legislative Oversight report made a major issue of the lack of work standards in the Maintenance Division, pointing out that they are important to scheduling, quality control, and other aspects of management.[1] Division managers have said that the development and use of work standards would be inappropriate in a general maintenance program because there are too many possible permutations of task demands, even for one job or piece of equipment. In responding to questionnaires, however, 42 percent of the maintenance mechanics said it would help them do a better job if they had work standards.

Findings: The Work Order System

The work order (and the work order system) could be one of the major management tools in the Maintenance Division and a primary means of communication from schools to the division and within the division. The original study design did not include plans for a study of the work order system because it was assumed that work orders would be the source of much of the data needed to answer questions about staffing, frequency of demand for service, costs, supplies, and so on. It quickly became apparent, however, that work orders could not provide the desired information and that the information was not available in any form to the Maintenance Division or the Department of School Facilities. The need to examine the work order system in relation to management was thus made obvious.

Because it will become an important point later, it must be mentioned here that division managers and area depot supervisors regard the work order primarily as a means of dispatching workers to the job, not as a management tool, and it is true that work orders are used for dispatching. Requests for service are made by a principal (or designee) to the area depot. A work order is written by the depot clerk. At first, the only information that can be entered is the name of the school and a description of the job. The work order is then passed on to the appropriate shop or mechanic, who is supposed to enter onto the work order (space is provided) information about materials and hours. The work order is then returned to the depot when the job is completed.

Work Order Audit

An audit of work orders was conducted to determine how much and what kind of information is entered on the forms (see Appendix B). Exhibit 7.2 shows each item of information which is supposed to appear on the work order and the percentage of work orders in the total sample which contained the information. It can be seen that certain information appeared on the vast majority of work orders: date, name of school, shop section, a legible job

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[1] An Evaluation of the Plant Maintenance Program of the Montgomery County Schools, Montgomery County Council, Office of Legislative Oversight, April 24, 1979. Transmitted to the MCPS Board of Education May 1, 1979.

Exhibit 7.3

PERCENTAGES OF RESPONDENTS ANSWERING NO TO QUESTIONS ABOUT WORKERS' PREPAREDNESS

Respondents/Questions	Answering "No"[a]
PRINCIPALS	
When maintenance workers come to your school, do they usually....	
Have the right tools and equipment with them to do the requested work?	12%
Do the requested work the first time they are there?	29%
BUILDING SERVICE MANAGERS	
When maintenance workers come to your school, do they usually....	
Bring the right tools and equipment with them the first time?	19%
Do the job(s) they are supposed to do the first time they come?	27%
MAINTENANCE WORKERS	
When you are sent out to work in the schools....	
Are you told exactly what job(s) you'll be doing there?	35%
Are you told enough about the job to know what tools, equipment, and supplies you need to do the job?	33%
Are the right craftsworkers usually sent to the school to do a job?	19%

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[a] Because a certain percentage of each group did not respond to a given item, it is not possible to determine the yes response by subtracting the above percentages from 100.

description (but see later), name of worker(s), and signature of school staff member acknowledging completion of the job. Other information was consistently lacking: pay rates, total hours, labor costs, and total job costs. Only 45 percent of the orders requiring the use of supplies from the central warehouse showed the cost of materials, and the cost of purchased materials was not recorded in almost 10 percent of the relevent cases.

The job description requires special mention because the work order is treated primarily as a means of informing workers about the job to be done. For purposes of the audit, "clear job description" was used to mean legible and comprehensible. It was not taken to mean that the description provided adequate information about the job to supervisors and mechanics. In 74 percent of the cases, it was possible for the auditor to read the job description. However, in 25 percent, the description was not legible, a fact which is probably closely related to the following data.

Exhibit 7.3 shows the percentages of principals, building service managers, and maintenance workers who answered no to questionnaire items dealing with how well prepared workers are to do a job. Twelve percent of the principals and 19 percent of the building managers said they do not believe maintenance workers have the right tools and equipment with them to do the work requested, and 29 percent of the principals and 27 percent of the managers said the workers do not do the work the first time they come to the school. More than a third of the workers themselves said they do not know exactly what job(s) they will be doing at the school and that they do not know enough about the job(s) to know what to take with them. Almost 20 percent also said the right mechanics are not usually sent to do a job. It does not seem, therefore, that the work order adeqately serves as a dispatching document.

The work order audit revealed that routine work orders (not capital projects) are not analyzed or processed. Copies are filed by school at area depots, and many of the second and third copies of an expensive self-carbon form are simply disposed of.

Implications of Findings

Despite the fact that a management system is in place, the Division of Maintenance is under-managed in terms of the assumptions made in the introduction. There is insufficient information available at upper echelons on which to base many of the important decisions managers must make. There has been some drift at both departmental and divisional levels. As far as can be determined, supervision and control are almost nonexistent. There are no work standards even for major jobs. The work order system is chaotic and, in many cases, does not even serve adequately as a job information/dispatching system.

Recommendations

- Management must be organized in such a way as to promote control over all aspects of the maintenance function.

- A supervision-inspection system must be developed.

  - Supervisory relationships should be formalized in written guidelines, and guidelines should be enforced.

  - The supervision-inspection system should include written reports or some other form of accountability.

- The resources needed to develop work standards should be determined, and long-range plans for writing work standards should be developed.

  - Initial long-range planning should begin in the near future.

  - Extant work standards like manufacturers' guidelines, tolerances, specifications, etc., should be assembled and circulated.

- The work order system must undergo total overhaul.

- A system for tracking work requests and the completion of jobs must be developed both in the division and in the schools.

- A study of the application of computer technology to the maintenance operation should be undertaken by managers in the near future.

CHAPTER 8

PLANNING AND SCHEDULING MAINTENANCE SERVICES

Introduction

The major requirement for effective planning and scheduling is information. Managers should know the current status of the operation: work in progress, availability of staff, etc. Regardless of time span, however, planning involves projecting future needs, which should mean projecting from the known to the unknown on the basis of current or past records. In addition, there should be a system for setting task priorities and scheduling. Individuals responsible for making decisions should be clearly identified and be accountable for those decisions. There should be schedules and reasonable deadlines for completing tasks. In short, there should be a planning system and a plan which results in the effective delivery of maintenance services.

A distinction must be made between the period during which data were collected for this study (September 1979 to May 1980) and the period after May-June 1980. A new maintenance planning system was introduced as a plan in October 1979 and presented to and approved by the Administrative Team in April 1980.

Thus just as data collection for this report was coming to an end, information about some of the maintenace needs of schools was being collected through the new system. In this report, then, the "current" (or similar wording) planning system refers to the situation which has prevailed for some time and at the time data were collected for this report. As will be shown, the scope of the new system is limited, so what is described here continues to apply to most maintenance functions.

Findings: Elimination of a Countywide Planning System

Until about ten years ago, the Maintenance Division had an annual planning and delivery system. Maintenance needs of schools were identified by principals, checked by representatives of the division, and approved or modified. Needs were prioritized, and a schedule for meeting them was planned and published by the division. It is claimed by administrators of the division that the system worked well, though this is somewhat beside the point. What is important is that the idea in itself represented a sound approach to planning and scheduling.

At some time between 1969-1971 this system was eliminated, though administrators of the Department of School Facilities and the Division of Maintenance were opposed to its being discontinued. It was decided, however, that developing individual school and countywide maintenance plans was too time consuming and costly. This decision has had long-range effects. It deprived department and division administrators of a major source of information and the means of carrying out some planning and scheduling. It may also have established an unofficial but generally accepted principle that maintenance planning is a cost MCPS cannot afford.

Findings: The Current Planning and Scheduling Process

Obtaining Information

A remnant of the previous planning system still exists. Principals continue to make annual maintenance requests, and in some schools the process has been "formalized."[1] As far as can be determined, information provided to the division by the schools is passed on only to the area maintenance depots. Depot supervisors use the information to determine job needs and priorities, but a large part of the information does not reach the division's central office in any systematic way.

Maintenance mechanics who work in the schools are in a good position to make observations and recommendations about the need for maintenance. However, on the questionnaire, 61 percent of them said they are not asked to make recommendations about what work needs to be done, 60 percent said they are not asked about equipment and tools that might be needed, and 67 percent said they are not asked to make recommendations for supplies.

Findings presented in the previous chapter show that neither the Department of School Facilities nor the Division of Maintenance collects, analyzes, or has available the information needed to describe current status or project future needs. Department and division administrators are aware that they do not have a sound data base, but they tend to blame the situation on the lack of staff and computer support.

Priorities and Allocating Staff

It seems as if job priorities are set by almost everyone in the Maintenance Division, including the mechanics themselves. There seems to be general agreement that emergencies (however defined by various individuals) have highest priority, but no system for establishing priorities or for scheduling routine and preventive maintenance was apparent to members of the project staff.

There are also no standards or guidelines for setting priorities, and therefore there is no systematic way of making decisions among what might be equally important needs for service. This, in turn, means there is no consistent scheduling. For example, during a recent summer, renovations were made at the Educational Services Center. During that time, much of the maintenance work which is normally scheduled to be done in schools during the summer was not performed.

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[1] About 40 percent of the teachers said on the questionnaire that they are asked to submit recommendations for the maintenance of buildings and grounds, 77 percent for maintenance of classrooms and their fixed equipment, and 69 percent for maintenance of instructional equipment.

Findings: Preventive Maintenance Planning

Preventive maintenance is, by definition, planned maintenance and includes any work designed to prevent deterioration or malfunction of facilities and equipment. An adequate program of preventive maintenance extends the functional life of buildings and equipment, reduces the need for repairs, heads off emergencies, and reduces costs.

In theory, there is a preventive maintenance program in MCPS. Some of the work is carried out under contract (resealing running tracks, for example). Some, like cleaning and lubricating heating, ventilating, and air conditioning equipment, is carried out by certain members of the School Plant Operations staff. A large part of the preventive maintenance, however, must be carried out by mechanics of the Maintenance Division.

There is general agreement among managers and supervisors that there is no real preventive maintenance program for the facilities and equipment which are the direct responsibility of maintenance mechanics. Depot supervisors said they can tell a plumber who is dispatched to a school on a routine job to check on all the plumbing and "tighten things up." This, however, is done on a day-to-day basis and is not a preventive maintenance program. There are a large number of trades in which mechanics perform virtually no preventive maintenance at all.

Department and division administrators report that there are preventive maintenance schedules for some jobs but that there are long backlogs: three years in air conditioning and plumbing, one year to bring the painting program to a seven-year cycle, and so on. Furthermore, these are estimates based on present levels of staffing, and actual backlogs may be even greater.

Findings: Facilities Planning

The literature of maintenance and school plant operations makes it clear that it is essential for representatives of the maintenance staff to have input from the beginning when new facilities or remodeling are being planned, because maintenance specialists can often head off potential maintenance problems. In addition, in MCPS work on many capital projects is performed not only by the 26-member renovation-remodeling crew but also by other maintenance mechanics as well. It is therefore important that capital projects be included in any maintenance planning and delivery system.

Administrative reorganization separated the Division of Planning from the Department of School Facilities and therefore also from the Maintenance

Division and the Division of Construction and Capital Projects. Educational specifications of a facility are developed by the new Department of Educational Facilities Planning and Development, while the budget is managed by School Facilities. This division of functions has resulted in noticeable deterioration in communication among units.

It was reported that the Maintenance Division has almost no input into planning of new facilities or of renovations. It was said that the division is given about 24 hours in which to review designs, that this is too little time, and that plans often do not provide enough information to enable staff members to know whether or not the products to be used will cause future maintenance problems. In addition, specifications and standards are said to be changed later, but the Maintenance Division is not represented at meetings in which changes are discussed and made.

In contrast, some managers said there is a well established review process and that plans for new facilities or renovations are circulated for review over a two week period. Individuals, rather than the Maintenance Division as a whole, may have only a limited time in which to examine plans, but, it was said, the time allowed is adequate. There is a separate set of MCPS product specifications which was developed, in part, by the Maintenance Division. It is therefore not necessary to include all standards or specifications on plans when they are circulated.[2]

Findings: The New Maintenance Planning System

The newly-instituted maintenance planning and delivery system is described in a memorandum to the administrative team.[3] The impression is created that it is a plan for the delivery of all maintenance services: renovation-remodeling, preventive, emergency, and routine. According to the plan, each principal is to prepare a maintenance request using a form supplied. Requests from all schools are to be reviewed by area associate superintendents and submitted to the Department of School Facilities. Directors of School Facilities and the Maintenance Division will review projects to determine costs, funding sources, work responsibilities, and schedules. A work plan is to be developed for each administrative area.

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[2] The review process will be investigated in the course of a future MORE study of Capital Projects and Construction.

[3] W. R. Porter, Transmittal memorandum to the Administrative Team, Proposed Maintenance Procedures, April 17, 1980. Attached: W. M. Wilder, Memorandum to principals, Annual Maintenance Request, Attachments A to C, April 21, 1980.

Despite the fact that the new plan seems to be a comprehensive maintenance planning and delivery system, as far as could be determined it is actually a procedure for identifying "those changes necessary as a result of program/activity changes." It may thus solve some problems of planning, funding, and coordination. However, it will not solve most of the planning and scheduling problems involved in the delivery of general maintenance services and will not provide much of the information the Maintenance Division needs but does not currently have or collect.

Implications of the Findings

There is no comprehensive system for planning and delivering maintenance services. Undoubtedly some maintenance work is being done very well, but too much is apparently being done on a day-to-day "catch up" basis. Priorities are set at every level of management and supervision and even by workers in the field. Staff and staff time may often be allocated to tasks for reasons that have little to do with the merits of the case or with needs elsewhere. A major reason for this situation is the lack of information administrators need to describe and evaluate the current status of the operation and on which to base projections of future needs.

The decision made a decade ago (to discontinue annual planning) deprived administrators of one means of obtaining information. However, it increased the need for obtaining it in other ways and from other sources: work orders, work standards, an inspection system, etc. To date, these other means of obtaining information have not been adequately developed or utilized.

Recommendations

There is really only one major recommendation here: A comprehensive maintenance planning and delivery system must be developed. The following are essential:

- The planning and delivery system must include every aspect of maintenance including preventive maintenance and capital projects.
- Mechanisms must be developed to collect, analyze, store, and retrieve essential operating and planning information.
- There must be a system for establishing task priorities and allocating staff which takes all maintenance needs into account and provides guidelines for making decisions among what may be equally important needs for service.
  - Individuals at all levels who are responsible and accountable for setting priorities and allocating staff should be clearly identified.
  - A lower-echelon limit of responsibility and accountability should be determined and adhered to.

- Effective lines of communication, responsibility, and accountability should be established among units whose major tasks are the planning, operation, and maintenance of school facilities.

- The new maintenance procedures and annual maintenance request system should be regarded only as a very preliminary step in the development of a comprehensive planning system.

CHAPTER 9

DELIVERY OF MAINTENANCE SERVICES

Introduction

The following basic assumptions were made to serve as criteria for judging the effectiveness of the delivery of maintenance services:

- There should be a system for requesting service and scheduling requests.
- Service should be delivered in a timely and efficient manner, and work should be performed and performed correctly the first time workers go to the school (with some reasonable exceptions).
- Users should be satisfied with the service.
- There should be some method for the division to check on the adequacy of the work and on user satisfaction.

Some other issues are also involved in the delivery of maintenance services. One is the extent to which there are conflicts in needs, demands, and services. Another is the overlap of functions of different MCPS units which share some responsibilities for school facilities and equipment, and whether or not this overlap interferes with the delivery of service.

Findings: Requesting Service and Response to Requests

Frequency of Demand

According to managers, the Maintenance Division responds to more than 50,000 requests for service annually. According to responses to the questionnaires, emergency services are needed in about 21 percent of the schools anywhere from two to three times in two weeks and in 46 percent of the schools about once in two weeks or at least once a month. Fifty-one percent of the schools make requests for routine service two to three times every two weeks, and approximately 87 percent do so either at least once a month or more frequently.

Requesting Service

Each school apparently has some means of obtaining information about maintenance needs and relaying it to the Maintenance Division. In general, schools adhere to the guidelines established by the division. Emergency requests are made by telephone; routine requests are made by memorandum. It is said by Maintenance Division staff members that sometimes routine requests are made to look like emergencies. It is also said that erroneous or vague information about a job will often be given because the individual making the request may not understand what the problem actually is.

MCPS Regulation 230-10 states that all schools will designate one area as the maintenance center. A clipboard (file folder, etc.), on which a list of current maintenance requests is kept, is to be placed at the center. Maintenance workers are to check in at the center and perform the work requested. This regulation is not followed uniformly.

Scheduling Requested Work

It was shown in the previous chapter that there is no system for establishing task priorities or scheduling jobs and that work orders often do not provide adequate information about the work needed. On the questionnaire, principals reported that they have little voice in determing when most work will be performed, though they said they do have a voice in scheduling jobs that would interfere with normal school functions. However, a large majority (62%) said they are not told when scheduled jobs will not be performed, information which would seem to be just as important as when jobs will be done. Forty-two percent of the teachers said on the questionnaire that maintenance jobs are sometime scheduled in such a way as to interfere with the instructional program. This may not be entirely the fault of the Maintenace Division because principals may decide that work should be done regardless of its effect on instruction.

Time Lag

According to responses to questionnaires, emergency maintenance service is delivered within a few hours to at most 24 hours after a request is made, and within the same day in a majority of cases. However, it was reported that requests for routine service are not responded to quickly. In about 20 percent of the schools, a worker arrives within the same week a request is made, but in 55 percent, a worker arrives more than a week after a request for service is made.

Reporting In

A small percentage of the maintenance mechanics (15% to perhaps 25%) reported on the questionnaire that they do not check in with anyone on the staff when they arrive at a school. A majority of mechanics said they do not discuss the work to be done with either a school administrator or the building service manager after arriving at the school. Apparently, mechanics tend to depend on the not-too-reliable work orders.

Job Performance

Twenty-nine percent of the principals and 27 percent of the building service managers said on their questionnaires that maintenance mechanics do not do the requested work the first time they come to the school. This is probably not a surprising finding in view of what has been said previously about the work order system and the supply problem in the Maintenance Division. However, according to 89 percent of the principals, when work is finally performed, it is done satisfactorily.

Feedback

As has been shown previously, work orders are generally signed by someone at the school to indicate that a job has been completed. However, 68 percent of the maintenance mechanics reported that no one at the school inspects the work to see if it was performed. Seventy-four percent of the principals said they know of no procedure used by the Maintenance Division for checking the adequacy of the work or determining the school staff's satisfaction with it.

Findings: User Satisfaction With Services

General Satisfaction

Exhibit 9.1 shows principals' and teachers' ratings of their satisfaction with maintenance services. There was a general tendency for both groups to express satisfaction. This is tempered, however, by the fact that the mean rating given by principals who responded to the item was 2.20, or slightly in the direction of dissatisfaction. The mean rating given to routine service by teachers who responded was 2.29, or somewhat dissatisfied.

Specific Facilities and Equipment

Exhibits 9.2 and 9.3 show ratings given to specific aspects of facilities and equipment by principals and teachers. Overall results tended to follow the general satisfaction ratings. Of the 23 items on the principals' list, 17 (74%) were rated well or acceptably maintained by 65 percent or more of the principals. Of the 25 items on the teachers list, 17 (65%) were rated well or acceptably maintained by at least 65 percent of the teachers.

Findings: Inadequate Maintenance

The general satisfaction ratings do not mean that all is well, and the data can be read as evidence that there are a number of serious maintenance problems. As a standard for judging the delivery of service, it is assumed here that if something was said to be inadequately or poorly maintained in 20 percent of the schools (principals' responses) or 20 percent of the class types (teachers' responses), a widespread problem exists, service is inadequate, and continued poor maintenance could lead to costly deterioration.

Exhibit 9.1

GENERAL RATINGS OF SATISFACTION WITH MAINTENANCE SERVICES

QUESTIONS

Principals and teachers were asked slightly different questions about their satisfaction with maintenance services, though both groups used the same rating scale.

Principals: What is your degree of satisfaction with the overall performance of the Maintenance Division?

Teachers : What is your general degree of stafisfaction with (1) emergency maintenance service (2) routine maintenance service?

RESULTS

Response (Scale Value)[a]	Respondents		
	Principals[b]	Teachers[c]	
		Emergency	Routine
Very satisfied (1)	11%	21%	11%
Satisfied (2)	55%	38%	54%
Dissatisfied (3)	25%	8%	19%
Very Dissatisfied (4)	3%	7%	9%
No basis to judge	0%	25%	8%
No response	6%	.5%	0%

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[a] A mean of 2.0= satisfied. A lower value indicates greater satisfaction, while a higher value indicates increasing dissatisfaction.

[b] Mean rating given by principals responding to item= 2.20

[c] Mean rating given by teachers responding to item: Emergency= 2.0 Routine=2.29

Overall rounding error= +/- 2%

Exhibit 9.2

PRINCIPALS' RATINGS OF MAINTENANCE OF FACILITIES AND EQUIPMENT

Item Rated	How Well Maintained			
	Well	Acceptably	Not Well	Poorly
Exterior of building	22%	35%	28%	14%
Ouside walkways and stairs	29%	46%	17%	5%
Blacktopped areas (athletic/parking)	28%	51%	17%	3%
Grounds (play areas, grass, etc.)	17%	57%	17%	8%
Interior walls and ceilings	19%	63%	11%	6%
Sliding walls and doors	28%	39%	15%	2%
Windows	23%	55%	12%	6%
Floors made of hard materials	32%	49%	12%	3%
Carpeted floors	29%	49%	5%	9%
Window shades and blinds	43%	43%	6%	6%
Gymnasium	22%	45%	9%	2%
Auditorium	28%	23%	5%	0%
Student restrooms	22%	46%	26%	5%
Staff restrooms and lounges	34%	55%	9%	0%
Cafeteria	42%	51%	5%	0%
Classrooms in general	25%	68%	6%	0%
Offices	42%	51%	6%	0%
Outside lights (on buildings, etc.)	28%	32%	23%	14%
Air conditioning equipment	20%	34%	28%	12%
Heating equipment	15%	49%	19%	14%
Interior lights	29%	54%	12%	3%
Heavy instructional equipment (shops, etc.)	20%	40%	5%	0%
Light instructional equipment (typewriters, projectors, etc.)	40%	45%	8%	2%

Rounding error = +/- 2%. In some cases the number of principals not responding was high, because some items do not apply to all types of schools.

The following were rated "not well" and/or "poorly" maintained by the percentage of principals shown in parentheses, which, in each case, is greater than the 20 percent standard (see Exhibit 9.2):

Exterior of building (42%)
Blacktopped areas (20%)
Student restrooms (31%)
Air conditioning equipment (40%)
Outside walks/stairs (22%)
Grounds (24%)
Outside lights (37%)
Heating equipment (32%)

The following were rated "not well" and/or "poorly: maintained by the percentage of teachers shown in parentheses, and again, in each case the percentage exceeds the 20 percent standard (see Exhibit 9.3):

Windows (21%)
Ditto/mimeo machines (22%)
Staff restrooms (22%)
Classroom furniture (22%)
Air conditioning equipment (27%)
Ventilation system (30%)
Drinking fountains (21%)
Student restrooms (30%)
Heating equipment (31%)

In addition to the rating list, principals and teachers were asked to comment freely on needs and problems. The following were frequently identified:

Leaks in roofs
Carpentry not done
Broken glass not replaced
Poor grounds care
Slow response to requests
Inadequate supervision
Lack of accountability for work/time
No job priority system

Findings: Conflicts in Demands for Service

The fact that there are conflicts among needs and demands for maintenance service has already been mentioned. On a day-by-day basis, the need for emergency service in one school interferes with the delivery of routine or preventive maintenance in another.[1] It has also been shown that there is no

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[1] Managers reported that emergencies always interfere with the delivery of other services.

Exhibit 9.3 Exhibit 9.3

TEACHERS' RATINGS OF MAINTENANCE OF FACILITIES AND EQUIPMENT

Item Rated	How Well Maintained Well	Acceptably	Not Well	Poorly
Grounds (play areas, grass, etc.)	42%	41%	10%	4%
Sliding walls and/or doors	33%	38%	5%	3%
Windows	26%	48%	12%	9%
Window shades and/or blinds	33%	44%	10%	6%
Ventilation system	20%	36%	17%	14%
Interior lights	36%	50%	12%	2%
Heavy instructional equipment	15%	20%	3%	2%
Ditto and/or mimeograph machines	29%	45%	17%	5%
Drinking fountains	29%	47%	15%	6%
Student lockers	15%	28%	7%	7%
Staff restrooms	36%	39%	16%	7%
Staff lounges	31%	44%	12%	7%
Staff dining room (area)	27%	32%	5%	3%
Cafeteria	47%	38%	4%	2%
Student restrooms	15%	41%	16%	15%
Classrooms in general	23%	57%	12%	5%
Classroom furniture	21%	51%	16%	8%
Outside lights (parking lots, etc.)	35%	33%	7%	4%
Locks and security gates	27%	30%	5%	3%
Air conditioning equipment	15%	20%	12%	14%
Heating equipment	17%	38%	15%	16%
Clocks	48%	39%	6%	5%
Bell system	45%	45%	4%	3%
School public address system	49%	42%	5%	2%
Light instructional equipment	37%	49%	7%	3%

Rounding error = +/- 2% In some cases the number of teachers not giving a rating was rather high because the item did not apply in certain schools.

overall system for setting priorities or for scheduling. There is also a "politics" of delivery of service. As has been shown previously, area administrative offices and the Educational Services Center often get preferential treatment, sometimes to the detriment of the schools. Finally, as has been said earlier, there are conflicts between capital projects and other maintenance work.

Findings: Divided Responsibilities

There is a kind of maintenance network which functions beyond the control of the Maintenance Division. The maintenance and repair of musical instruments, for example, is performed under a contract not managed by the Maintenance Division, and the Division of Transportation maintains motor vehicles. The greatest overlap of services and functions, however, is among the Division of Maintenance, the Department of School Services, and School Plant Operations.

Plant equipment operators and/or building service managers, both in Operations, are responsible for the operation and first-echelon maintenance of the major heating, ventilating, and air conditioning equipment in the schools. Building service managers are also responsible for making other emergency repairs and adjustments and for identifying and requesting repairs. All building service workers are responsible for some type of first-echelon maintenance of the school.

The supply function of the Department of School Services impinges on the delivery of service by the Maintenance Division, especially the operation of the maintenance supply at the Shady Grove site. It has already been mentioned that there are supply problems which reduce the effectiveness of the decentralizaion plan for the Maintenance Division.

The findings already presented suggest that some services are "slipping through the cracks" of overlapping responsiblilities. Many of the items identified by principals and teachers as unsatisfactorily maintained are problems most likely to be caused by this phenomenon.

Implications of the Data

The criteria used for evaluating the delivery of maintenance services are not being met with uniform success. While there is a system for requesting service, correct information is not always obtained from the schools. In any case, there is no system for setting priorities or for scheduling. The time within which the Maintenance Division responds to emergency calls is apparently satisfactory, but this is not true for routine requests. In about a third of the cases, maintenance mechanics do not perform the requested work the first time they visit a school. There are no regular procedures in the division for checking on the adequacy of work or on user satisfaction.

In general, teachers and principals are satisfied with the overall performance of the Maintenance Division. However, the evidence provided by these users of service show that there are many problems, some of which are major and widespread.

There are conflicts in demands for maintenance services which are not taken care of adequately because there is no overall planning and scheduling system. Responsibilities for maintenance are divided among many MCPS units, and because of the scattering of responsibility, many jobs are not being done effectively or, perhaps, not being done at all.

Recommendations

Many recommendations which bear on the delivery of service are made elsewhere. The following should be considered regardless of what organizational changes may be made in the future:

- Develop a plan or system for gathering individual school needs for routine maintenance.
- Identify some school staff member to be responsible and accountable for regular inspection and reporting of maintenance needs. (The building service manager is already responsible for reporting according to the job description and is the logical person to conduct inspections.)
- Encourage maintenance mechanics to carry out informal inspections while they are at schools, and develop a means for them to report needed work.
- Consider alternative means of organizing services that will reduce the time lag between the request for and the delivery of service.
- Re-institute the "school maintenance center," but only if it promises to have a favorable impact on the delivery of service.
- Make it mandatory for the maintenance mechanics to report in to some member of the school staff, preferably someone with whom the job request can be discussed.
- Make it mandatory that the school staff member who "signs off" on the work order also inspects the work before signing (preferably the building service manager).
- Accord administrative offices the same treatment as the schools when planning and scheduling maintenance services.

Exhibit 10.1

LEAVE USED IN
MAINTENANCE DIVISION SHOPS
FY 1976 AND FY 1977

	FY 1976	FY 1977
Average number of employees	424	417
	(Leave given in number of hours)	
Sick Leave	40,314.5	33,876.1
Family Illness	6,737	6,577.8
Annual Leave	63,874.5	62,618.6
Board of Education Holiday	48,243	40,122
Bereavement Leave	1,400	1,412
Disability Leave	13,412	10,583
Military Leave	336	728
Civil Leave (jury duty, etc.)	429	184
Personal Leave	8,922	8,484.4
Participation in MCC[illegible]SEE negotiations	62	149.5
Release Time (college courses)	162.5	37
Unusual and Imperative Leave (with pay)	-	224
TOTAL PAID HOURS	183,892.5	164,996.4
ABSENCE WITHOUT PAY	1,025	2,147
GRAND TOTAL	184,917.5	167,143.4
Mean number of paid hours per worker	434	396
Mean total hours per worker	436	400

Source: Division of Maintenance

CHAPTER 10

STAFF STABILITY AND TRAINING

Introduction

In addition to the issues of staffing which have already been discussed, there are other personnel issues which are related to management, supervision, and the delivery of maintenance services. Therefore, the following questions are addressed here: What is the relationship between leave and the delivery of maintenance service? How stable is the maintenance work force, and what are the effects of worker turnover? Is training of maintenance mechanics adequate, and are additional training programs needed?

Findings: Leave and the Delivery of Service

Until 1977, the Maintenance Division produced annual summary reports of the amount and type of leave used in its shop sections. The practice was discontinued because, it was said, no one in MCPS seemed interested in the data. Exhibit 10.1 is therefore the latest summary of all types of leave.

In FY 1976, 87 percent, and in FY 1977, 91 percent of all paid leave was accounted for by normal leave categories which are general through MCPS and which require no special action: sick leave, annual leave, holidays, and personal leave. Bereavement, military, and unusual-imperative leave with pay (which take administrative action) accounted for only 1.2 percent of the total paid hours of leave in FY 1976 and 1.5 percent in FY 1977. In no cases do the various major categories of leave seem excessive. Disability leave is high (7.3% in 1976 and 6.4% in 1977) as a percentage of all leave, but maintenance mechanics are probably exposed to more hazards in the performance of their jobs than are many other MCPS staff members.

At the bottom of Exhibit 10.1 are the mean number of hours of leave per worker per year. The average worker was on leave for 434 hours or 10.85 working weeks in FY 1976 and for 396 hours or 9.9 working weeks in FY 1977. This represented the equivalent of a reduction of the work force by 88 workers in 1976 and 80 in 1977. There is no substitute system, and when a worker is on leave, work is not done. Therefore, it can be assumed that this effective reduction of the maintenance work force has both short-term and widespread long-term effects on the delivery of service.

Findings: Staff Stability

Exhibit 10.2 shows some demographic characteristics of the maintenance work force and some selected averages. As can be seen, the Maintenance Division staff is dominantly male and white, the average age is 40.6 years, and the average length of service in MCPS is 11.3 years. The average turnover rate of

5.2 percent is much lower than the 12.4 percent rate for all MCPS support staff, and the Department of Personnel Services assumes the rate will continue to be low in the future.

In general, the maintenance staff is a "young" work force, with 68 percent of the workers 45 years of age or younger. There is no problem of turnover which would demand the immediate development of a training and/or recruiting program to guarantee a supply of workers in the future. However, there is a problem in making provision for working supervisors, who are presently somewhat older than the average. Among that group, 59 percent are between 51-56 years of age or older, which means they are in the age range in which retirement will be possible within the next few years.

Findings: Positions and Staff Training

Positions and Entry Level

As the Maintenance Division is presently organized, most positions require training in a skilled trade (apprenticeship or trade school) and experience at some recognized level of competence (e.g., journeyman). Some also require a trade license or certificate. The only position which is "entry level" in the general sense is that of General Maintenance Worker I. According to the job description, "Employees of this class perform (under close supervision) a variety of moderately heavy or heavy manual labor not requiring a high degree of manipulative skill or previous experience." Only 17 of these positions (7% of the staff) were included in the FY 1981 budget.

Filling Positions

Not surprisingly, the Maintenance Division has some difficulty filling vacancies in its skilled positions through direct recruitment and hiring. Position requirements must sometimes be waived, resulting in hiring of underqualified mechanics who need more training. It is reported that there is a need for mechanics in roofing, air conditioning, flooring, videotape repair, boiler repair, and typewriter repair. However, there is some question about the need for the large number of specialists employed by the division (as opposed to generalists), and therefore a special recruitment or training program should be launched only after careful consideration of alternatives.

Training Opportunities

Maintenance mechanics, like other MCPS staff members, are eligible to take job-related courses for which they receive tuition reimbursement. They may also take courses offered by the Department of School Services and, on occasion, may take courses offered by various equipment manufacturers.

Otherwise, MCPS offers no formal training program in skills or for promotion. Promotion within a trade is based on experience, and there are few promotional positions.

Exhibit 10.2

SOME DEMOGRAPHIC CHARACTERISTICS OF MAINTENANCE MECHANICS

SEX	N	PERCENT
Male	386	99%
Female	2	1%
Total[a]	388	100%

RACE	N	PERCENT
White	360	93%
Black	26	6%
Other	3	1%
Total	389	100%

AGE RANGE	N	P'CT[b]	CUM. P'CT[c]	
56 +	54	14%	14%	100%
51-55	35	9%	23%	86%
46-50	36	9%	32%	77%
41-45	45	12%	44%	68%
36-40	63	16%	60%	56%
31-35	63	16%	76%	40%
26-30	50	13%	89%	24%
18-25	41	11%	100%	11%
Total	387	100%		

SELECTED AVERAGES

Average Age	40.6 years
Average MCPS Service	11.3 years
Average 5-year Turnover	
Maintenance Workers	5.2%
All MCPS Support Staff	12.4%

Source: Personnel Printout

[a] The total number of workers varies among characteristics because of differences in the number of "valid" cases reported on the printout.

[b] Rounded

[c] Cumulative percent. On the left are the percentages of workers who are at or above (older than) the given age limit. On the right are the percentages who are at or below the given age limit. For example, 44% are 41 years of age or older (see left), 56% are 40 years of age or younger (see right). All percentages are rounded.

In response to questionnaire items about training, 41 percent of the mechanics said they need more training in their trades, and 42 percent said they need more general education courses. In the following shops, the percentages of mechanics who said they need more training were well above the overall 41 percent:

Air conditioning/refrigeration (64%)	Oil Burner Controls (72%)
Electrical (56%)	Electronics (59%)

However, despite the perceived need for training, only 35 percent of all mechanics said they had taken any training or general education courses in the last three years.

Training MCPS Students

It is possible that student trainees could supplement the present maintenance work force and provide a pool of future mechanics. The Maintenance Division has in the past and is currently engaged in such training. In FY 1980, 11 students participated in programs in oil burner maintenance, air conditioning, plumbing, and minor electrical repair. In the summer of 1979, the division hired 30 students in building trades and 30 others for grounds maintenance. There are no data to show how successful this program has been, but the director says that students have contributed to the overall maintenance program.

Implications of the Findings

The total amount of leave used by maintenance workers has the effect of reducing the work force at any given time by 80 or more mechanics. This must have long-range effects on the maintenance program. Given the leave policies which prevail in MCPS, however, it is difficult to see how the general problem can be approached and solved. It is possible that some alternative mode of delivering services would help but it is doubtful that any arrangement could completely compensate for the 20 percent or more of a work force on leave every day, week, or year. Covering for workers on leave might be approached through training. For example, it could be made mandatory that every maintenance mechanic be certified in two trades. Thus the likelihood that there would be no one trained to perform the work of a mechanic on leave would be rather small. However, since such training would tend to increase rather than decrease specialization, it would have to be coordinated with overall plans for the delivery of maintenance and operations services (see Part VI).

Staff stability in the Maintenance Division is high. If there is a problem of aging and attrition, it is primarily among supervising mechanics, but even many of these workers have many productive years of service in MCPS before retirement. Overall staff stability could become a problem, however, if there were an attempt to change the composition of the staff by creating more maintenance generalists than specialists. The highly skilled workers in the Maintenance Division can easily learn additional or different skills.

However, they would still be primarily trade specialists and might object to retraining and reclassification.

Some kind of training program is obviously needed in maintenance. However, it is not clear what kind of training should be offered--or to whom--because so many financial and organizational considerations are involved. It has been shown previously that there may already be too many trades specialists and too few generalists in the Maintenance Division, and it would therefore not be desirable to train even more specialists. However, 41 percent of the maintenance mechanics said they need more training in their trades, and division managers have said that already trained mechanics, not trainees, are needed, especially in some critical trades. Finally, if a new Division of Facilities Management or a similar unit is created, managers will have to coordinate the training of both maintenance and school plant operations workers with plans for reorganization of the delivery of services, job assignments, and promotional opportunities (see discussion in Part VI). For the present, there does seem to be a need for an in-service training program for working maintenance supervisors because, as has been shown, there is a need for more supervision and job control. In the immediate future, the program should be restricted to presently employed supervising mechanics and any area depot supervisors who have not had such training recently.

Maintenance mechanics, especially those in critical trades identified here, should be encouraged to take advantage of the MCPS tuition reimbursement program and to enroll in trade school or attend courses offered by manufacturers. (Recognizing that if release time were granted it would reduce the number of work hours.) Other more extensive training programs should not be offered, however, until organizational changes and decisions about the delivery of services have been made.

Work experience programs for MCPS students can augment the maintenance program and should be continued and possibly expanded. One program which might be developed in the future was suggested by Maintenance Division managers. Under the direction of teachers and building service managers, students would perform "home owner" maintenance in a given school or cluster of schools. Among other advantages, it was suggested that this sort of student involvement would reduce vandalism. Again, however, the development of a program of this kind should not be considered until a total organizational plan has been implemented.

Recommendations

Recommendations here must be very general because decisions about staff training and development are related to broad decisions about the structure and staffing of the division and to alternative modes of delivering both maintenance and school plant operations services (see Parts V and VI). The following, however, are derived from the findings presented here:

- A system for "covering" high priority work which would normally be done by a worker on leave should be developed.
- Develop and offer an in-service supervisory training program for already employed area depot supervisors and supervising mechanics. Training should be general, not oriented to a specific trade.
- No training programs (except supervision) should be developed until decisions are made about staff organization, composition, and the delivery of combined maintenance and operations services.[1]
- Work experience programs for MCPS students should be continued. Any future expansion of work experience programs should be coordinated with general plans for the delivery of maintenance and operations services.

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[1] A planning group made up of representatives of the Department of Personnel Services, the Department of Staff Development, and the Division of Maintenance has been working on a Skilled Trades Training Program for approximately two years. The program would be open to MCPS staff members interested in receiving training in maintenance. There would be an affirmative action compoent aimed at minority groups and women. The planning group has presented recommendations, but the program has not yet been developed fully and training is not yet being offered.

PART III

SCHOOL PLANT OPERATIONS

Exhibit 11.1

FY 1970- FY 1980 OPERATING AND SCHOOL PLANT OPERATIONS BUDGETS EXPRESSED AS RATIOS OF THE FY 1969 BUDGET[a]

Fiscal Year	Total Operating Budget	School Plant Operations Budget
1980	1.25	1.15
1979	1.32	1.12
1978	1.37	1.30
1977	1.38	1.37
1976	1.38	1.41
1975	1.38	1.48
1974	1.37	1.42
1973	1.36	1.46
1972	1.26	1.36
1971	1.19	1.19
1970	1.11	1.07
1969	1.00	1.00

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[a] Corrected for inflation on the basis of the Consumer Price Index. The year 1969 is taken as the base year, and therefore is 1.00.

CHAPTER 11

COSTS AND BUDGET

Introduction

This chapter reviews the costs and the budgeting process for school plant operations. Utilities and energy management are not included here but are discussed separately in Part IV.

Findings

Operations Costs and Trends

In FY 1980, $14,800,000 was allocated to School Plant Operations. This represents a slight relative increase over the 1979 budget, but a relative decrease below spending levels between 1971 to 1978. Exhibit 11.1 shows the total MCPS operating budgets for the years FY 1969 to FY 1980 and the School Plant Operations budgets for the same period. A correction for inflation based on the Consumer Price Index has been made, with 1969 as the base year (or 1.00). Each annual budget is shown as a ratio of the 1969 budget; so, for example, in 1970, the total MCPS budget was greater than the 1969 budget by 1.11 in terms of 1969 dollars. (A function or service which cost $1,000,000 in 1969 would have cost $1,110,000 in 1970--in 1969 dollars.) The 1980 total operating budget was 1.25 greater in terms of 1969 dollars.

As can be seen, the total budget increased regularly in terms of 1969 dollars between 1970 and 1975. In 1975, a plateau was reached, and the total budget began a relative decline in 1978 which has continued to the present.

The School Plant Operations budget rose less sharply than the total budget in 1970 (1.07 vs. 1.11) but was equal to the total budget in 1971. It was relatively greater than the total budget between 1972 and 1976. Beginning in 1977, however, the School Plant Operations budget began to decline more than the total budget.

Part of the relative decrease has been accounted for by salaries. From FY 1976 to FY 1980, the number of building service workers positions decreased at the same rate as enrollment (16 percent), but at a far higher rate than the 9 percent decline in the number of facilities in operation (see the following chapter for a discussion of staffing).

Budget Planning[1]

Budget planning and allocation procedures for Operations may be lowering resource levels too rapidly. Guidelines for staffing have never been implemented, and staffing allocations are based largely on levels established in previous years, which, as shown above, are typically reduced even further. Equipment allocations are also based on budgetary considerations rather than on actual needs. Allocations for custodial supplies are based on enrollment, which may not reflect actual requirements, and in recent years, no increase for inflation has been added to the supply allocation. Much essential information on the supply needs of each school is not available, and what is available is not used for budget planning. Variations in cleaning requirements of different facilities are not taken into account.

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[1] See also Chapter 14, Planning and Scheduling.

Joint Occupancy

Surplus space in schools is leased under certain conditions, and each user is expected to reimburse MCPS. Fees are supposed to reflect MCPS costs, comparable market prices, and the profit/nonprofit status of the tenant. However, fees for tenants who provide educational or community programs are not intended to recover all MCPS costs. Regardless of tenant status, an inflation factor has not been added to fees.

Community Use of Schools

During times when schools are not being used for instruction, community groups can lease space for an hourly fee. Actual costs to MCPS far exceed income from these fees. For example, in FY 1979, the income was $476,643 for 114,958 hours of paid community use, or an average of $4.15 an hour. This was less than the real cost of utilities alone. That is, if it is assumed that utilities costs were spread over 24 hours a day for 365 days, the average hourly cost was $5.98 as opposed to the $4.15 average hourly income derived from community-use fees.[2] Administrative costs and the costs of custodial staff and supplies were not accounted for at all. MCPS is, therefore, subsidizing the community use of schools.

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[2] Based on utility costs for all MCPS facilities. This is the most highly conservative computation. If utility costs for school buildings alone were used, or if the computation were based on fewer operating hours or only on schools used by community groups, the average hourly utility rate would be far higher than $5.98, and the disparity between costs and income would be much greater.

Recommendations

Many recommendations which are made later in this report have a bearing on costs and budget. Only the following, therefore, are made here:

- Make no further cuts in the Operations budget until decisions are made about managerial and operational issues discussed in Parts V and VI.
- Either raise fees for joint occupancy and community use of schools to cover MCPS costs or recognize that the "supplemental" effort must come from the educational budget. If fees are raised, the rate scale should include an adjustment for inflation.
- Develop a budget planning process that reflects actual Operations needs and the actual needs of individual schools.

Exhibit 12.1

COMPARISON OF MCPS STAFFING WITH STAFFING IN NEARBY COUNTIES

County	Number of Schools	Student Enrollment	Number of Workers	Mean N Workers Per School	Mean N Pupils Per Worker
Montgomery	187	102,445	992	5.3	103.3
Prince George's	205	127,558	1408.5	6.9	90.6
Fairfax	177	127,744	1107	6.3	115.4
Baltimore	147	100,725	1362.4	9.3	73.9

CHAPTER 12

STAFFING OF OPERATIONS

Introduction

This chapter addresses the question of the adequacy of Operations staffing. It is difficult, however, to determine how many building service staff should be budgeted for or assigned to a particular school. There are various commercial and educational guidelines and standards, but in MCPS, the use of what may be inappropriate standards could be reducing building service staff too rapidly. It was shown in the previous chapter that the Operations staff has decreased at the same rate as enrollment but more rapidly than the decline in the number of facilities in operation.

Findings

Guidelines

In 1965, the Department of School Services developed staffing allocation guidelines based on the number of teaching stations in a school. These guidelines were never implemented. If they were applied as a test of the adequacy of staffing in 1980, MCPS would be understaffed by about 225 building service workers.

Another set of guidelines based on the number of square feet per facility was developed in 1972. These guidelines have also not been followed. Again, if they were used as a test of the adequacy of 1980 staffing, MCPS would be understaffed by 113 workers in elementary schools and 208 workers in secondary schools.

Comparison With Other Counties

The number of workers allocated in the MCPS FY 1980 budget was compared to the number in nearby county school systems of similar enrollment and number of schools. Exhibit 12.1 shows the results. MCPS ranks second in number of schools, third in enrollment, but last in the number of building service workers. It has the smallest number of workers per school and the second highest average pupil load per worker.

Coping With Demands for Service

Exhibit 12.2 shows responses of school-based staff members to questionnaire items dealing with scheduling and workload. It is important to observe that 34 percent of the principals said the building service staff is not able to

Exhibit 12.2

PERCENTAGES OF RESPONSE TO QUESTIONS BEARING ON STAFFING

Respondents/ Questions	Responses YES	Responses NO
PRINCIPALS		
Is the building service staff at your school usually able to complete all scheduled jobs?	66%	34%
Does the work schedule adequately account for all work that needs to be done?	52%	48%
Is your staff usually able to complete additional but necessary unscheduled jobs?	68%	29%
TEACHERS		
Are there enough building service workers at your school to do all general cleaning and housekeeping tasks that need to be done?	49%	50%
BUILDING SERVICE MANAGERS		
Are building service workers usually able to follow their daily work schedules?	89%	9%
Are they usually able to finish their schedules?	84%	13%
BUILDING SERVICE WORKERS		
Are you usually able to follow your work schedule?	81%	16%
Can you usually finish your schedule each day?	81%	16%
Do you spend a lot of time doing jobs that aren't on your daily schedule?	40%	59%

Overall rounding error by item = +/- 2%. Small percentages of no-response not reported.

complete all scheduled jobs, and 29 percent said the staff cannot usually complete unscheduled but necessary work. The response of workers, 59 percent of whom said they spend a lot of time doing unscheduled jobs, tends to support the principals' report that daily schedules do not account for all essential tasks.

Other Considerations

Until about three years ago, there was a pool of building service workers from which substitutes could be drawn to cover absentees' work stations. Because of cuts in budget and staff, the pool had to be eliminated. Substitutes must now be drawn from other schools, which means that the school supplying the substitute is temporarily deprived of a worker.

In addition, in recent years, modifications and additions have been made to many school buildings. Though some of these changes have increased the workload of the building service staff, additional workers have not been assigned to the schools that have been affected.

Implications of Findings

According to 1965 or 1972 guidelines, Operations is badly understaffed. It is also understaffed in comparison with other nearby school systems of about the same size as MCPS. The problem is, however, that there are no consistent guidelines or measures of what a truly adequate level of staffing should be besides those already developed and ignored. Still, it is probably fair to say that Operations is functioning at or very near its minimum staffing limit and that the effects of the situation are being felt in various ways.

Whatever the case, daily work schedules in the schools account for a minimum number of tasks which workers can usually complete. However, many essential tasks are not accounted for on the schedules, though workers may devote a considerable amount of time to them. Many jobs do not get done, perhaps because there are not enough workers.

It is possible, of course, that staffing is actually adequate and that problems are caused by inefficiencies in management, planning, scheduling, and utilization of staff. It is therefore also possible that different managerial practices or a different organizational structure could vastly improve the effectiveness of the present staff.

Recommendations

Staffing is part of a total organizational and management system. It is therefore difficult to make recommendations without taking the entire system into account, and thus the following are minimum recommendations:

- Realistic staffing guidelines based on extant professional standards should be developed.

- No further cuts should be made in Operations staffing until there are sufficient data on which to base decisions.
- Up-to-date work plans should be developed for each school.
  - All essential tasks should be included.
  - Plans should be based on the best professional estimates of staff time (but see also chapters on management and scheduling).
- An efficient plan for providing substitutes for absentees should be developed.
- Consideration should be given to alternative ways of deploying the Operations staff to gain increased efficiency.

CHAPTER 13

MANAGEMENT, SUPERVISION, AND CONTROL

Introduction

The following are the three major management-related issues to be dealt with in this section: How does the current management system function? Are administrators and supervisors able to exercise effective control and do they do so? Are there work standards to facilitate managerial and supervisory control?

Findings: The Management System

Given the current organization of Operations, it is not possible to talk about management and control in any broad sense. Rather, it is as if there are multiple systems: the Department of School Services and the nearly 200 separate schools. In the Department of School Services, the director has control only over area building service supervisors. In any given school, the principal is the administrator of all building service functions. The building service manager is responsible for directing the building service staff. The principal has control over some but not all aspects of staffing, personnel matters, and supplies and equipment. However, a principal does not exercise control over the number of building service positions allocated to a school and only very limited control over supplies and equipment.

Findings: Effectiveness of Control

At the departmental level, managerial control seems rather loose, though it must be remembered that the director has control only of area building service supervisors. Area supervisors work out of the area office, not out of the director's office at the Lincoln Center. They apparently have considerable freedom to set their own schedules and priorities and have to perform only a minimum number of tasks which require reporting in one way or another to the director.

Data about the effectiveness of management were obtained primarily from questonnaires. Exhibit 13.1 shows some results. It might be noted first that in 14 percent of the schools the building service manager reported having contact with an area supervisor less than once in six months, and in 34 percent of the schools it was said that the area supervisor inspects the school less than once in six months (and never in 10 percent).

The managerial-supervisory role of the building service manager is also suspect. A majority (52%) of the building service workers said the manager does not inspect every day, 11 percent said they are not told by the manager that their work is satisfactory or unsatisfactory, and 92 percent said they do not have to check with the manager before performing a nonscheduled job (which casts doubt on the managers' control over job assignments). It was reported in 37 pecent of the schools that the principal, the primary manager, does not make inspections of the work of the building service staff.

Findings: Work Standards

Work standards are written job procedures which include descriptions of how the job should be done, materials to be used, specifications or tolerances, and how long the job should take. They become, in effect, standards against which the effectiveness of work can be judged. In addition, work standards can contribute to budget planning, planning and scheduling of tasks, and other aspects of management.

No work standards exist for any of the tasks performed by the Operations staff. The Department of School Services staff are familiar with work standards and argue that they are not necessary for most of the tasks performed by building service workers. However, in responding to questionnaires, 79 percent of the principals said work standards should be used, and 63 percent said they should be the same for all schools. Nearly 40 percent of the building service managers and 30 percent of the workers said it would help them to do a better job if there were standards.

Implications of the Findings

Managerial and supervisory control over building service staff and functions are rather loose. The extent to which the Department of School Services can have an impact on what goes on in the schools is either actually limited by the division of responsibility and authority or by the way in which managers interpret the department's role. Area building service supervisors probably do not visit and inspect schools regularly, and in perhaps 30-40 percent of the schools neither the principal nor the building service manager regularly inspects the work of the building service staff. Given these circumstances, it is almost inevitable that many jobs must not be done or are done inadequately. It is probably also inevitable that optimal use is not being made of staff, time, supplies, and equipment.

Principals are the primary managers of building services, but they do not typically receive specialized training in school plant operations. They should be able to depend on the knowledge of those who are specialists to tell them how to use resources most effectively. Those specialists are in School Services. However, the Department of School Services has not developed standards for school plant operations. In the absence of standards, principals (or their designees), building service managers, and the workers themselves must exercise their own judgment. It is doubtful that there is general agreement among these individuals about the importance of various

Exhibit 13.1

PERCENTAGES OF NEGATIVE RESPONSES TO ITEMS DEALING WITH MANAGEMENT AND SUPERVISION

Respondents/Questions	Percentages of Respondents
PRINCIPALS	
1. The building service manager does not formally inspect the work of the building service staff.	28%
2. The building service manager does not report the results of inspections to the principal or the principal's designee.	31%
3. Principal does not make formal inspections of the work of the building service staff.	37%
BUILDING SERVICE MANAGERS	
1. Never talk to principal about work of building service staff or do so less than once a week.	27%
2. Talk with area supervisor about own work or staff's work less than once in 6 months, school year, or never.	14%
3. Area supervisor (or someone from School Services) inspects work of building service staff less than once in 6 months, once a school year only, or never (10%)	34%
BUILDING SERVICE WORKERS	
1. Building service manager does not inspect work every day	52%
2. Manager does not inspect work at least once a week	10%
3. Principal never inspects work	35%
4. Never told by BSM that work is/is not satisfactory	11%
5. Never told by principal that work is/is not satisfactory	34%
6. Do not have to check with BSM before doing a non-scheduled job	92%

Only the negative forms of the questions are presented here. On the questionnaires, many responses were possible, including favorable responses.

tasks or about the actual technical requirements of some tasks. Countywide guidelines and standards are therefore needed. There is also the need for a division to render technical assistance and monitoring.

Recommendations

- Identify or constitute an administrative unit to develop, establish, and monitor compliance with minimum countywide standards for school plant operations.
- As soon as possible, begin the development of standards for the first echelon maintenance of heating, ventilating, air conditioning, and other fixed equipment. Assemble the literature, including manufacturers' standards, dealing with the optimal frequency and methods of performing other major tasks.
- At longer range, develop task frequency standards and work standards for all major tasks and begin the development of standards for repetitive tasks.
- Improve the within-school inspection and communication process.
- Offer principals training in the management of school plant operations staff and functions.

CHAPTER 14

PLANNING AND SCHEDULING OPERATIONS SERVICES

Introduction

The situation faced by Operations is different than that faced by the Maintenance Division. In maintenance, demands for emergency and routine services change from hour to hour and day to day. In Operations, there are also daily emergencies. However, for the most part, the tasks to be performed tend to be repetitive, and Operations managers should be able to plan for a rather stable daily, weekly, and even annual situation and set of tasks. Therefore, one of the major products of Operations planning should be a work plan (schedule) for each school which identifies what tasks are to be done, how often, and when they are to be done during the school day (week, month, etc.).

Findings: Operations Planning

The skeletal framework of a planning system already exists. In theory, the principal of each school identifies the school's needs for the next fiscal year. The area building service supervisor reviews the needs and passes them on with recommendations to the Director of School Services. The director reviews the needs of all schools and, to the extent possible, incorporates them into the School Services budget. A work schedule is to be planned by the principal and building service manager and submitted to the area building supervisor for review. The schedule is supposed to be based on the needs of the school and the number of building service workers required to do the essential jobs.

In actual practice, however, planning does not begin with the identification of needs and procede through a process which assures the needs will be met. Rather, critical decisions about staffing, equipment, and supplies are made largely on the basis of past history and budget cutting (see Chapter 11, Costs and Budget). Cuts in staff and funds have been made without reference to guidelines or other means of judging if they are justified either generally or in particular schools.

In addition, more than $33 million has been devoted in recent years to remodeling and renovations, many of which have altered work loads and work patterns. However, representatives of Operations have not been asked to participate in facilities planning and have not even been asked to review designs. Therefore, the department can only respond to, not plan for changes in task demands caused by changes in design of facilities. Furthermore, changes in work load caused by such changes are not considered in budgeting and allocating resources.

Though the Department of School Services may often be forced into responding to circumstances instead of planning for the delivery of services, it could play an important role in setting standards which would make it possible to develop school work plans on a sound basis. However, as has been discussed in the previous chapter, no standards are in use (or being developed) in MCPS. There is therefore no basis for planning the delivery of services for the school system in general or for individual schools.

Findings: Work Plans

Since there is no true overall planning system and no set of standards, the work plan in any given school is actually a compromise, a response to events generally beyond the control of the principal and building service manager. Though the area building services supervisor is supposed to review work plans and inspect to see they are being carried out, there is no evidence (see previous chapter) that this is done regularly.

Responses to questionnaires tend to support the general impression of the current status of work planning and scheduling obtained from previously presented findings. Some schools apparently do not have work plans at all. In nearly half of the schools, work plans do not account for all work that needs to be done. Large jobs like shampooing carpets are not scheduled separately in all schools to assure that they will be done adequately.

In addition, there is some confusion about who exercises managerial control over workers and their schedules. The building service manager is directly responsible for and should have control over task identification, setting priorities, and assigning workers to jobs--including control over unscheduled or unanticipated jobs. However, in 42 percent of the schools, building service managers said on the questionnaire that workers are interrupted "a lot" from their daily work schedules, and 40 percent of the workers said they spend a lot of time doing unscheduled jobs. This, in itself, might not be a problem if managers were able to exercise control. However, in many schools almost any staff member is allowed to interrupt workers to get help with nonscheduled tasks. In at least 25 percent of the cases, staff members deal directly with the worker, not with or through the building service manager.[1] This practice undercuts the authority of the manager and almost guarantees that schedules will be disrupted and uncompleted.

Findings: Community Use of Schools

Area building service supervisors reported that the community use of schools affects the entire Operations program, the use of energy, the use of supplies, and worker morale. They believe the cleanliness and general maintenance of the schools are being sacrificed.

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[1] In small schools which have a limited building service staff, it may sometimes be necessary for other staff members to deal directly with the worker.

Their opinions were confirmed by responses to questionnaires. Exhibit 14.1 shows that 52 percent of the principals and 37 percent of the teachers said their school is less or much less clean the day after a community group uses it, and 33 percent of the teachers said their own classroom is less or much less clean. Almost 30 percent of the building managers said the staff cannot clean up in time for the next school day after a community group uses the building.

Area building service supervisors point out that schools are not reimbursed for supplies used directly by community groups or used because of the extra burden imposed by these groups. The director of the Department of School Services does not consider this a problem. In any case, however, while MCPS may be reimbursed (but see Chapter 11, which shows that MCPS is not fully compensated), the individual school is not reimbursed at all and may experience shortages of supplies.

Implications of Findings

There is no overall planning for the delivery of Operations services that begins with the identification of actual school needs and ends with the development of an individual school work plan supported by adequate staff, supplies, and equipment. What has passed for planning has tended to be budgeting of diminishing resources. There is a high probability, therefore, that at least some schools are understaffed and undersupplied. However, it is also possible that sound planning would show that more effective use could be made of present resources.

Work plans are not, at present, the end product of sound planning. Most schools have them, but they are not necessarily kept up to date and they apparently do not account for all of the work that needs to be done. Many do not account even for major jobs. Interruptions of workers' schedules are commonplace because too many staff members can make direct demands on workers. Work plans are not reviewed regularly by area building supervisors.

The community use of schools adversely affects planning and scheduling of the Operations program. Providing additional staff and supplies to schools used by community groups may not be unreasonable, but only if community use fees pay for all actual costs. In any case, individual schools should be reimbursed for supplies used by and for community groups (see Chapter 11).

The organization of School Plant Operations may be partly, but certainly not entirely responsible for the general lack of planning. It is possible to fault the Department of School Services for not providing standards and for inadequate monitoring. However, there is a lack of central Operations management which currently makes it difficult to knit together everything that should go into planning and the delivery of service.

Recommendations

Again there is a great deal of overlap between ideas presented here and those discussed in other chapters. Therefore, some of the following recommendations may also be made elsewhere in similar form:

- An overall planning system for the delivery of Operations services should be developed.
    - It should begin with the identification of actual school needs as determined by standards and guidelines to be developed.
    - It should include planning for all aspects of needs: staff, supplies, and equipment.
    - While budgetary considerations must be taken into account, they should not be used as standards.
- Technical standards and guidelines must be developed as a basis for planning and work plans/schedules.
- Work plans must be made the end product of planning and
    - Must be based on acceptable technical standards
    - Should take into account changes in workload
    - Should be revised periodically
    - Must be monitored by regular inspections.
- An administrative unit should be identified or formed to take leadership in Operations, to plan for the delivery of services, to develop standards, and to monitor compliance with standards. The unit should be represented when new facilities, renovations, or remodeling are being planned.
- The role of the building service manager should be clarified and supported. All members of the school staff should not be allowed to interrupt workers.
- Consideration should be given to limiting the number of schools used by community groups, and fees should reimburse MCPS and the schools for Operations (and all other) costs. Another possibility is to recognize that MCPS is providing a "supplement," though in any case, schools should be reimbursed for supplies.

Exhibit 14.1

RESPONSES TO QUESTIONS ABOUT COMMUNITY USE OF SCHOOLS

Questions	Responses and Respondents			
	NO DIFFERENT		LESS OR MUCH LESS CLEAN	
	Prin.	Teach.	Prin.	Teach.
If community use is made of your school, what is its general condition the next school day?	46%	41%	52%	37%
What is the condition of your classroom the next day?	-	27%	-	33%

Respondents/Questions	Responses	
PRINCIPALS	YES	NO
Does community use of schools disrupt the daily schedule of the workers during normal school hours?	45%	54%
BUILDING SERVICE MANAGERS		
When communit groups use your school during non-school hours, can your staff clean up in time for school the next day?	67%	27%

Rounding error by item and respondent group= +/- 2%. Small percentages of no-response not reported.

CHAPTER 15

DELIVERY OF CUSTODIAL SERVICES

Introduction

This chapter focuses on how well custodial services are delivered and does not include a discussion of the operation of school plant equipment. A related issue is the extent to which overlapping responsibilities among MCPS units may affect the delivery of services.

Findings: Scheduling and Requesting Service

In the previous chapter it was shown that the daily work plan (schedule) in a large number of schools does not account for all repetitive work that needs to be done. In addition, there are many requests for unanticipated tasks (emergencies, changing light bulbs, etc.) that might be scheduled if they were properly handled. There is apparently an informal system for making such requests (though it varies from school to school), and the requests are responded to quickly in the vast majority of cases according to teachers. Again, however, as was shown in the previous chapter, about 25 percent of the teachers make requests for unanticipated service directly to building service workers, not to the school office or the building service manager--a situation which should be avoided for the most part because it has an impact on the overall scheduling and the delivery of service.

Findings: User Satisfaction

In General

Eighty-six percent of the principals who responded to the questionnaire said they are satisfied or very satisfied with the performance of scheduled jobs by the building service staff, and 76 percent said they are satisfied or very satisfied with the performance of unanticipated (unscheduled) jobs. Seventy-eight percent of the teachers also said they are satisfied or very satisfied with the general level of performance of the building service staff.

To some extent, this high level of general satisfaction is probably a reflection of the belief that the building service staff is doing a good job with the resources available, but does not mean that all work is actually being done (see previous chapter).[1] Furthermore, nearly 25 percent of the

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[1] Principals are managers of building services, so their responses are probably not completely unbiased.

Exhibit 15.1

PRINCIPALS' RATINGS OF THE CLEANLINESS OF FACILITIES AND EQUIPMENT

	How Well Cleaned			
Item Rated	Well	Acceptably	Not Well	Poorly
Exterior of building	32%	39%	17%	6%
Outside walks and stairs	40%	37%	20%	-
Athletic and parking areas (blacktopped)	25%	51%	20%	3%
Grounds (play areas and grass, etc.)	17%	52%	26%	3%
Interior walls and ceilings	35%	46%	15%	2%
Sliding walls and doors	34%	42%	8%	-
Windows	20%	42%	29%	8%
Hard floors (tile, stone, wood, etc.)	42%	46%	9%	-
Carpeted floors	28%	51%	12%	2%
Window shades and blinds	23%	57%	14%	5%
Gymnasium	23%	39%	11%	5%
Auditorium	25%	22%	9%	-
Student rest rooms	23%	48%	22%	6%
Staff rest rooms and lounges	26%	55%	14%	3%
Cafeteria	43%	46%	8%	-
Classrooms in general	25%	66%	6%	2%
Offices	35%	57%	5%	2%

Rounding error= +/- 2% Percents of no-response not reported. In some cases, the number of principals not responding was high, because some items do not apply to all types of schools.

principals and 22 percent of the teachers said they are dissatisfied or very dissatisfied with the performance of the building service staff. Since principals' responses generalize to schools and teachers' to class assignments, this represents relatively widespread dissatisfaction.

Specific Facilities and Equipment

In Chapter 9, it was pointed out that a standard for judging the adequacy of the delivery of service was adopted for purposes of this report. That is, it is assumed that if something was said to be inadequately or poorly maintained in 20 percent of the schools (principals' responses) or in 20 percent of all class types (teachers' responses), a widespread problem exists. That same standard is used here as a basis for judging cleanliness of schools.

Exhibits 15.1 and 15.2 show principals' and teachers' ratings of the typical state of cleanliness of facilities and equipment. As can be seen in Exhibit 15.1, the following were said to be "not well" and/or "poorly" cleaned by the percentage numbers of principals shown in parentheses, which, in each case is equal to or greater than 20 percent:

- Exterior of building (23%)
- Outside walks/stairs (20%)
- Athletic/parking areas (23%)
- Grounds (29%)
- Windows (37%)
- Student restrooms (28%)

The following were rated as not well or poorly cleaned by the percentages of teachers given in parentheses:

- Windows (36%)
- Window shades/blinds (26%)
- Drinking fountains (25%)
- Staff restrooms (29%)
- Staff lounges (27%)
- Student restrooms (35%)
- Classrooms in general (25%)
- Classroom furniture (30%)

It has been said in previous chapters that it is almost inevitable that some jobs are "slipping through the cracks" of ineffective planning, scheduling, and management of Operations services. That conclusion is supported by these evaluations of specific services by principals and teachers.

Findings: Overlapping Responsibilities

In Parts I and II, the problem of overlapping responsibilities of the Maintenance Division and Operations was discussed at some length. It was pointed out that it is not always clear who is responsible for what. Therefore, the issues dealt with here are the following: Do building services

Exhibit 15.2

TEACHERS' RATINGS OF THE CLEANLINESS OF FACILITIES AND EQUIPMENT

	How Well Cleaned			
Item Rated	Well	Acceptably	Not Well	Poorly
Grounds (play areas, grass, etc.)	37%	47%	10%	3%
Sliding walls and doors	32%	38%	5%	2%
Windows	21%	37%	23%	14%
Window shades and blinds	27%	40%	15%	11%
Interior lights	30%	41%	11%	3%
Heavy instructional equipment	14%	17%	4%	2%
Ditto/mimeograph machines	30%	44%	11%	3%
Drinking fountains	27%	44%	17%	8%
Student lockers	17%	27%	9%	5%
Staff rest rooms	35%	34%	19%	10%
Staff lounges	28%	40%	17%	10%
Staff dining room/area	27%	29%	5%	5%
Cafeteria	43%	36%	6%	4%
Student rest rooms	11%	40%	19%	16%
Classrooms in general	23%	49%	17%	8%
Classroom furniture	20%	44%	21%	9%

Rounding error = +/- 2% Percents of no-response not reported. In some cases, the number of teachers not responding was high, because some items do not apply to all types of schools.

staff members perform any jobs that should be done by the Mainenance Division? Do overlapping responsibilities interfere with the delivery of custodial services?

Responsibilities

According to their job descriptions, all Operations staff members are responsible for making certain types of repairs or performing some first echelon maintenance. However, job descriptions are sometimes vague about the limits of workers' responsibility. The problem, then, is not whether they should perform maintenance work but whether they do more or less than they should. Maintenance Division managers and supervisors say building service workers do attempt to do more than they should and often create more problems than they solve. In contrast, Department of School Services managers and supervisors say the building service staff are trained to recognize the difference between jobs they should do and those which should be done by the Maintenance Division.

Questionnaire Results

Exhibit 15.3 shows responses of principals and building service staff to questions about maintenance work. The last item in the exhibit is important in that it shows that 39 percent of the building service workers said they are not told which jobs they should not do.

The vast majority of principals said building service workers do not perform seven of the eight types of jobs listed, including those they should be responsible for according to job descriptions. The one exception is painting walls or rooms, for which they are not responsible, but which 51 percent of the principals said the building service workers perform. Building managers' responses do not seem to agree with those of principals until the first three categories are combined.[2] When this is done, percentages of building managers who said the maintenance jobs listed are performed by building service workers are far higher in most cases than percentages of principals.

In some schools, then, perhaps in the majority, building service staff members are apparently performing maintenance jobs for which they are responsible, but in other schools they are not doing so. They are also performing maintenance jobs which are rather clearly not their responsibility in some or a majority of schools. Furthermore, it is impossible to know to what extent they may be exceeding the bounds of their responsibility and knowledge when they work on boilers, air conditioners, electrical fixtures, and plumbing.

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[2] That is, the sum of very often, often, and seldom. "Seldom" should be taken to mean "sometimes" as opposed to the possible response "never."

Exhibit 15.3

RESPONSES OF PRINCIPALS AND BUILDING SERVICE MANAGERS TO ITEMS RELATED TO MAINTENANCE

Respondents/Questions	Responses		
PRINCIPALS	YES	NO	NR[a]
Do building service workers in your school sometimes do any of the following jobs?			
o Painting (walls or rooms)	51%	49%	0%
o Carpentry (building shelves, partitions)	3%	97%	0%
o Repairing boiler	11%	86%	3%
o Repairing air conditioner	11%	88%	2%
o Plumbing (involving replacing parts)	5%	95%	0%
o Repairing doors, hinges, locks	37%	63%	0%
o Replacing glass in windows	23%	77%	0%
o Electrical repairs (sockets, switches)	17%	83%	0%

BUILDING SERVICE MANAGERS	VERY OFTEN	OFTEN	SELDOM	NEVER	NR
How often do you or your staff do the following?					
o Painting (walls, rooms, etc.)	8%	17%	31%	41%	3%
o Carpentry (building shelves, partitions)	0%	6%	19%	72%	3%
o Repairing boiler	5%	6%	27%	56%	5%
o Repairing air conditioner	2%	5%	28%	63%	3%
o Plumbing (involving replacing parts)	6%	9%	34%	47%	3%
o Repairing doors, hinges, locks	14%	17%	42%	25%	2%
o Replacing glass: windows or doors	14%	8%	28%	48%	2%
o Electrical repairs (sockets, switches)	8%	14%	31%	45%	2%

BUILDING SERVICE WORKERS	YES	NO	NR
Are you told which jobs you should not do because they are jobs for maintenance workers?	59%	39%	2%

Rounding error= +/- 2%

[a] NR= no response to item

Interview Findings

The director of the Department of School Services said the questionnaire data should be treated cautiously because workers may believe that replacing a screw in an air conditioner constitutes making a repair. It was admitted, however, that because of "interpretations of the building service staff" it is possible that workers may be making independent (and sometimes wrong) judgments. It was also said that an Operations worker may be told by the principal to do a given job which may be beyond the individual's responsibility or capability and that workers may be reluctant to refuse.

Delivery of Service

The findings suggest that the present confusion about who is responsible for what creates a situation in which either nobody assumes responsibility for particular jobs or in which some jobs are poorly done by the wrong person. Building service workers are performing Maintenance Division jobs. This means that while they are doing so, they cannot also be spending the time on their assigned custodial tasks.

Implications of Findings

In general, and within narrow limits, principals and teachers are satisfied with the overall service provided by the building service staff. There are many problems, however. Work plans do not account for all custodial work that needs to be done, and unanticipated requests interrupt work schedules. Some facilities and/or equipment are not adequately cleaned or cared for. The overlap of responsiblities between Operations and the Maintenance Division aggrevates the situation.

Recommendations

Few recommendations can be made here that are not made in other chapters because the effective delivery of service is the product of organization, staffing, management planning, and scheduling. Some of the following may therefore be repetitious, and the list does not include all recommendations that have a bearing on the delivery of service:

- All recommended managerial and supervisory controls over work must be instituted, including a system for inspection.
- Work plans must account for all necessary work that can be anticipated.
- Requests for unanticipated jobs must be routed through the building service manager and handled with the least disruption of the daily work schedule.

- Guidelines--including rewriting of job descriptions if necessary--must be developed to distinguish between tasks and responsibilities of Operations workers and Maintenance Division mechanics.
  - Managerial controls must be instituted to guarantee adherence to guidelines.
  - If job descriptions are rewritten, they should reflect administrative changes and changes in the organization of services discussed in Parts V and VI.

CHAPTER 16

SUPPLIES AND EQUIPMENT

Introduction

The issues of supplies and equipment are somewhat different in Operations than in the Maintenance Division. In the Maintenance Division, the major problems are the delivery (or location) and control of supplies, and there is no evidence that the division does not obtain the basic supplies and equipment it needs to carry out its functions.[1] In Operations, the major problem is the availability of sufficient supplies and equipment. Schools may not be getting basic necessities, and this may interfere with the delivery of Operations services.

Findings

Planning

The Department of School Services was allocated about $500,000 for supplies and equipment in FY 1980. As is pointed out in Chapter 14, this allocation is not determined by a real planning process which begins with the identification of needs and results in meeting those needs. Instead, the equipment allocation is based on previous allowances with some permitted increase within the superintendent's guidelines. The total supply allocation is based on enrollment, as is the individual school's allocation. No increases for inflation have been approved in recent years.

The use of enrollment as a standard for supply allocations does not take into account variations in school design or use which might create different demands among schools, and no data on the actual need for or utilization of supplies are collected for planning purposes. Furthermore, the allocation of funds for supplies for an individual school are not increased even though the building may have been renovated or modified in such a way as to increase the amount of supplies needed.[2]

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[1] Though it was pointed out that the supply and equipment budget in the division is not based on information about actual needs.

[2] The director of the Department of School Services may find a way to make allowances for this. However, the points are that enrollment may not be the best standard and that there is not an actual planning system.

Procurement

There is no regular supply and equipment testing program. Area building service supervisors do pretest products submitted by companies that want to be added to the MCPS bidders' list. However, there is no testing thereafter, despite the fact that area supervisors report that the product which is delivered is sometimes not of the same quality as the product which was pretested. In addition, many products are said to be ineffective. They may be returned, but this may mean delays in performing essential work.

Some new products may be more effective or, in the long run, less expensive than those now being used. For example, some products are packaged in premeasured units, which reduces storage space, prevents deterioration, and decreases the amount used. However, though costs could possibly be reduced by using these and other new products, the Department of School Services is not allowed funds to purchase and test them.

Volume Buying

Supplies and equipment are purchased in compliance with MCPS bidding and procurement procedures. The Department of School Services establishes an annual budget for supplies at each school, and a reserve amount is held aside to permit additional purchases during the year. Building service managers prepare requisitions at regular intervals and forward them to area building service supervisors for approval. School accounts are debited, and the warehouse revolving fund is credited.

Delivery of Supplies

There does not seem to be a problem of delivery of supplies. Requisitions are filled by the warehouse, and deliveries are made to schools. It has been reported that on occasion building service managers or workers must pick up supplies from the warehouse. If this is true, it is a questionable practice which could waste time and interfere with the delivery of service. Again, however, the delivery of supplies does not seem to be a major problem as it is for the Maintenance Division.

Control of Supplies

At each school, the building service manager is responsible for the security and distribution of supplies and equipment. There is no problem *per se* with vesting control and accountability in building service managers or at this level of management, particularly since area supervisors say they monitor the consumption of supplies when they review requisitions.

At present, however, there is a problem in the use of supplies for noncustodial purposes. Teachers are able to draw on custodial supplies for instructional use, and these supplies are charged to the Operations budget instead of to the instructional budget. (For example, an art teacher may use a sizeable quantity of paper towels.) The practice not only strains the Operations supply budget, but creates a situation in which supplies can be taken by virtually anyone for any purpose without accounting for them.

Community groups which use the school also both use custodial supplies and cause an increase in the use of supplies by building service workers (more cleaner used in sinks, etc.). Though it has already been shown that the fees charged to community groups do not fully reimburse all actual costs, a $100,000 fund was established to compensate MCPS for supplies. However, schools are not compensated individually and may experience a shortage of supplies or supply funds.

Implications of Findings

The lack of a real planning system and the use of what may be inappropriate standards for budget allocations create a situation in which some schools may be oversupplied and some may be badly undersupplied. In schools that do not receive adequate supplies and equipment, the delivery of Operations services will be unfavorably affected. Some essential work will be delayed or not done at all, particularly first echelon maintenance which is heavily dependent on adequate and effective supplies.

A planning system is obviously needed. Data should be collected, and actual need, not budgetary restrictions, should be the basis for allocations. An inflation factor must be added to the supply budget to assure that Operations will not continuously fall behind. Variations in need among schools and use of buildings should be expected and accounted for, and enrollment should not be the sole criterion for supply allocations. Modifications to schools must also be accounted for, and supplies and equipment allocations should be increased or decreased if modifications result in changes in need.

It is possible that meeting actual school needs would result in increases in the supply and equipment budgets. However, it is also possible that increases could be offset by the use of more effective products and procedures. A modest investment in a testing program could, therefore, save money in the long run.

An inventory control system is needed at the school level. However, it would not be entirely effective unless supplies used for instruction and other noncustodial purposes are charged to the appropriate budgets. This is also true of supplies used by community groups. In both cases, individual schools, not a general MCPS fund, should be compensated for the supplies used.

Recommendations

- o Develop a planning system for Operations supplies and equipment.
  - . Collect data on actual needs.
  - . Add an inflation factor to the budget.
  - . Account for variation in needs among schools, and change allocatins when modifications are made to schools.

o Develop and implement a system for testing new products and procedures.

o Establish an inventory control system in schools.

o Charge supplies to the appropriate budget (instructional, operations, etc.) and reimburse schools, not the general fund, for supplies and equipment charged to other budgets.

CHAPTER 17

STAFF STABILITY AND TRAINING

Introduction

This chapter deals with personnel issues which are related to the delivery of service in some way: absenteeism, staff stability, training, and staff perceptions of opportunity within the school system. It should be noted that for purposes of this chapter all leave will be referred to as "absenteeism" in the sense that a worker on leave is absent from the job, not in the sense that it is not legitimate leave. This is the way in which the situation is perceived at the school level.

Findings: Leave and the Delivery of Service

Exhibit 17.1 shows responses of principals and building service managers to questionnaire items dealing with absenteeism (and includes one question about turnover). According to principals, absenteeism is a problem in about 52 percent of the schools, and 41 percent of the building managers agreed. While this may not mean absenteeism is excessive, it does mean it is a widespread problem, primarily because substitutes for absentees are not provided. Therefore, when a building service worker is not on duty, some service is not delivered.

It is pointed out by the Department of School Services that leave is approved at the school level by the principal and/or the building service manager and that it is their responsibility to deal effectively with attendance problems. Area supervisors also said that it is the lack of substitutes, not absenteeism, that is the problem. They pointed out that it was possible at one time to "overhire" if a worker were absent for a long time, but job freeze policies prevent this now even though the safety and health of staff and students are ultimately involved.

Findings: Staff Stability

The Operations staff is dominantly black (78%) and male (91%), with a mean age of 37 years. More than half (56%) are building service workers, about 20 percent are building service work leaders, and about 20 percent are building service managers. Plant equipment operators represent only 6 percent of the work force.

Overall, and in each position category except building service manager, between 82 and 83 percent of the workers are 50 years of age or younger; this is also true for 79 percent of the managers. Half of all building service staff members are 36 years of age or younger, and there are only small

Exhibit 17.1

RESPONSES OF PRINCIPALS AND BUILDING SERVICE MANAGERS TO QUESTIONS ABOUT LEAVE AND TURNOVER

Questions	Responses/Respondents			
	YES		NO	
	Prin	BSM	Prin	BSM
Is absenteeism among your building service staff a problem?	52%	41%	48%	59%
When a building service staff member is absent, is a substitute provided?	0%	NA[b]	98%	NA
[a]Is turnover among your building service staff a problem?	20%	41%	80%	56%

Rounding error by item and respondent group = +/- 2%. Small percentages of no-response not reported.

[a] Question was asked as follows on building service managers' questionnaire: "Does worker turnover (quitting, leaving, the job, getting fired, getting promoted) cause a problem in getting the work done?"

[b] NA = question not asked on given questionnaire.

differences in the median ages of workers in each position category. The Operations staff, then, is a comparatively young work force, and age is not a handicap in obtaining promotional positions. There is no reason to believe that there will be a future problem in replacing supervisors and managers, most of whom should be able to look forward to a long period of service in MCPS.

There is a problem of turnover among building service workers, as shown in exhibit 17.2. (See also Exhibit 17.1 for opinions of principals and building service managers.) The overall MCPS supportive services turnover rate is 12.4 percent. The rate among building service workers is 18 percent. However, the rate among other building service staff members is much lower.

It is difficult to explain this high turnover rate among building service workers. The director of the Department of School Services pointed out that low wages cannot account for high turnover because the salaries and benefits offered by MCPS are good. One possible explanation, he said, is that there are few promotional opportunities in Operations (but see workers' perceptions later in this chapter).

Whatever the reason, turnover among building service workers adversely affects the delivery of service. The reasons are the same as for absenteeism. No substitutes are provided, and the absence of one worker means that some jobs are not performed.

Findings: Staff Training

Need for Training

In responding to the questionnaires, a majority of principals (59%) and building service managers (61%) said the building service staff need more training in custodial work. A majority of both groups of respondents also said the staff need more training in the operation of plant equipment. These responses tend to confirm the general narrative reports picked up in the course of the study, i.e., that building service workers are not well trained.

Training Provided

Exhibit 17.3 shows the in-service training program offered by the Department of School Services. Courses are open to all staff members. All staff may also take any other in-service course (for which they are eligible) offered by MCPS and take advantage of tuition reimbursement opportunities.

The director of the Department of School Services said other training is offered only when needed. For example, training in shampooing carpets was given when carpets were first installed in a large number of classrooms. For the most part, workers are shown what to do by the building service managers. However, only about half of the building service workers reported having

Exhibit 17.2

COMPARATIVE TURNOVER RATES FOR FY 1979

Employee Category	Turnover Rate
All MCPS Supportive Services	12.4%
Building Service Staff as a Whole	15.6%
Building Service Workers	18.0%
Building Service Work Leaders	9.0%
Plant Equipment Operators	8.3%
Building Service Managers	1.5%

Source: Department of Personnel

Exhibit 17.3

DEPARTMENT OF SCHOOL SERVICES
IN-SERVICE TRAINING PROGRAM FY 1980

Course	Required For	Length	Certificate
Boiler Operations	Promotion	24 hrs.[a]	Yes
Plant Equipment Operation	BSM/PEO/WL[b]	24 hrs.[a]	Yes
Supervisory and Leadership Skills	BSM/PEO/WL	24 hrs.[a]	Yes
Refresher	Boiler Certificate Update	12 hrs.[c]	Validation (Every 3 yrs)

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[a] 12 2-hour sessions

[b] BSM= building service manager, PEO= plant equipment operator, WL = building service work leader

[c] 4 3-hour sessions

received training of any kind, and only 31 percent said they have taken some training within the past three years.

Findings: Job Satisfaction and Promotion

Job Satisfaction

A majority of building service managers (61%) and building service workers (58%) said on the questionnaires that they are satisfied with their jobs, though in both cases nearly 40 percent said they are not. A large majority of building managers (77%) and workers (72%) said they believe their chances for promotion in MCPS are good, and almost all (92% of managers and 85% of workers) said they know what they need to do to get a promotion. It does not seem, therefore, that workers' perceptions of promotional opportunities enter into job satisfaction. However, 38 percent of the managers and 26 percent of the workers said they are not encouraged by their superiors to seek promotion, and it may be this rather than how workers view opportunities that could, at least partly, affect job satisfaction.

Actual Opportunities

Building service staff members may be overly optimistic. Their promotional opportunities in Operations, School Services, and MCPS generally are actually extremely limited. First, turnover among building managers, work leaders, and equipment operators is very low. There are only minor differences in ages among these groups, and there is likely to be little attrition. Furthermore, supervisors tend to be locked into their positions because there are not many top-level positions for them to move into.

Given their background and experience, it would seem logical that some building service staff members (especially building service managers and plant equipment operators) could be promoted into the Maintenance Division. However, there are few entry level positions in that division, and the great need as the division is presently organized is for trained mechanics, not trainees.

Implications of the Findings

Absenteeism is a problem in the delivery of Operations services as is turnover among building service workers, partly, at least, because there is no system for providing substitutes. Formation of a pool of substitutes or another means of organizing services might mitigate the problem but would not solve it entirely if the same rate of turnover persisted.

While lack of promotional opportunities may be partly responsible for the high turnover rate, responses to questions about promotion do not suggest it is a major reason. In any case, regardless of what is done about training and promotion, some workers will still have to do the "dirty" jobs. Turnover among these workers is high everywhere and will continue to be high in MCPS unless a special effort is made to reduce it. This could include worker awareness programs, awards programs, and others designed to show building service workers they are important and appreciated in MCPS. Outreach programs may also have to be developed in Employee Assistance and other units.

Because of the high costs potentially involved if equipment is inadequately maintained or abused, there is an immediate need to review the recency and adequacy of the training of building service managers and plant equipment operators in the operation and maintenance of plant equipment. If necessary (and according to the staff it is necessary) additional in-service training should be mandated and provided.

There is also a need to provide workers a formal in-service training program in how to perform basic custodial tasks. The training should be on a continuous, required cycle and should not be left entirely in the hands of building service managers.

At somewhat longer range, all building service staff members might be provided with training in making "handyman" repairs, since all of their job descriptions say they are responsible for making repairs of one kind or other. However, it is pointed out in Part VI that future plans for training (or re-training) school plant operations workers and maintenance mechanics must be coordinated with plans for organizing the delivery of services. It is possible, depending on how services are delivered, that training a custodial worker in "handyman" repairs would be the starting point for a career as a maintenance mechanic, building service manager, crew leader, and so on. Of course, much more information is needed and many questions will have to be dealt with by administrators before the specifics of either training or promotional opportunities can be determined.

Recommendations

As usual, though the following recommendations stem from the findings presented here, some have already been made elsewhere:

- Substitutes must be provided for building service staff members on leave in situations in which the absence of one worker adversely affects the delivery of service.
  - Until the delivery of maintenance and operations services is reorganized, consideration should be given to forming a substitute pool, but not from the present limited staff.
  - Job freeze policies should not apply to building service positions when overhiring is necessary to provide long-term substitutes.

- The turnover problem among building service workers must be attacked in various ways. Consideration should be given to the following:
    - Development and implementation of a special orientation program
    - Development and implementation of worker awareness and awards programs
    - Special encouragement of building service workers to take advantage of MCPS educational benefits
    - In-service programs to meet the educational needs of workers should be developed
- A broader formal training program must be developed for all building service staff members. At a minimum, it must include the following:
    - More and better training in the operation and maintenance of plant equipment
    - Training in performing custodial tasks
    - Ongoing training in new methods of performing jobs and the use of new or better materials and equipment
- Coordinate training and promotion of maintenance and operations workers with future reorganization of the delivery of service (see Part VI.)
    - Managers of the new Division of Maintenance and Operations (or other new unit) must study the training and career needs of a merged maintenance and operations staff.
    - Staff training and promotional opportunities must be designed to reflect merged functions, administration, and delivery of service.

PART IV

ENERGY MANAGEMENT

INTRODUCTION TO ENERGY MANAGEMENT

Energy management falls under the Department of School Services, which also administers some aspects of School Plant Operations. Heating, ventilating, and air conditioning equipment is operated by building service managers and plant equipment operators in School Plant Operations. Therefore, it was originally intended that energy management be treated as another topic in the Operations study. However, it quickly became apparent that it is a major topic in its own right.

Between FY 1969 and FY 1979, energy costs increased from 2.2 to 3.8 percent of the total MCPS operating budget and far exceeded increments in other school services. Furthermore, it is probable that the cost of energy and utilities will continue to increase internationally, nationally, and locally for a long time in the future, though all forms of energy may not increase in cost at the same rate. Energy and utilities costs, therefore, could continue to erode the MCPS instructional budget if preventive action is not taken. At present, as is said above, energy and utilities are "managed" by the Department of School Services in the sense that the department sets and monitors policies, budgets, and disburses funds. However, the department has only a very small, two-member energy management staff, which has little authority and often works in isolation from other MCPS units on which the energy staff should have an impact. In the broader sense, the control of energy and utilities costs is in the hands of every MCPS staff member.

This generally unfavorable situation, despite appearances, does provide some reason for limited optimism. As has been learned by millions of homeowners, businesses, and institutions all over the nation, energy and utility consumption and costs can be reduced. Even a 1 percent reduction of MCPS's $12,000,000 energy budget would save $120,000. There is, then, a great and relatively unexplored opportunity for savings in the energy and utilities budget.

It should be mentioned that data collection for this report had ended before the draft Energy Plan was presented to the Administrative Team. Comments on the draft plan were not due until September, and it is not known at the time of this writing when a revised draft will be produced. Therefore, it is not possible to relate the findings and recommendations in this report directly to the draft Energy Plan. As far as is known, there are no major differences between this report and the draft plan in intent or direction, though there may be differences in emphasis and/or detail.

CHAPTER 18

THE MCPS ENERGY PROGRAM

Introduction

This chapter describes the current organization of energy and utilities management. It also presents questionnaire findings which show how school-based staff members perceive the effectiveness of the energy program.

Findings: Energy Administration

Organization and Scope

Polices and guidelines for energy use and conservation are developed by an energy specialist and an assistant in the office of the Director of School Services. These two individuals are responsible for the full range of activities required for the entire MCPS energy management program, among which are the following:

- Preparing the annual Resource Conservation Plan
- Conducting energy audits
- Developing proposals for federal, state, and local funding
- Designing and coordinating the computer control of plant equipment for 14 schools
- Monitoring utility costs and collecting and reporting data on energy use

The number and variety of tasks and the importance of the function to MCPS are such that the level of staffing is inadequate.

Actual responsibility for energy-related functions or activities is divided among a number of units. For example, facilities planning and capital project management affect energy consumption, but the units responsible for them are divided between the Department of School Facilities and the Office of Instructional Planning and Development. The Maintenance Division, under the Department of School Facilities, also has an impact on energy-related functions. Furthermore, in each school, monitoring of energy consumption and the implementation of conservation procedures are assigned to an individual designated by the principal.

This scattering of responsibility has caused problems. For example, the Energy Conservation Plan does not tell what the energy staff can or should do about monitoring and enforcing policies or the extent to which school staff members can follow up on precedures. Or, for another example, the energy staff say it was found during the installation of computer controls that the maintenance of heating, ventilating, and air conditioning controls had been inadequate. Maintenance supervisors, on the other hand, say the controls on some equipment were not designed to be compatible with computer hookups.

Management Data

Annual and monthly energy consumption and cost data of the kind needed by the energy staff are produced by computer for each facility. However, the energy staff consider the data inaccurate, difficult to interpret, and out of date when they are received.

The energy staff currently have little involvement in the approval and payment of utility bills and are consulted only when there are apparently major discrepencies. As a result, the staff who have both the expertise and the responsibility do not have control over either the data or the disbursement of funds.

Findings: Use of Energy and Utilities

Reductions in Use of Energy and Utilities

During recent years there have been decreases in the use of some fuels or utilities. The use of natural gas decreased 11 percent over FY 1978 and 1979, and there was a 15 percent reduction in fuel oil during the same two years. In FY 1979, water use decreased 11 percent compared to FY 1978, and the use of electricity declined by 12 percent.

It is probable that these decreases cannot be attributed to the closing of facilities. It is true that from FY 1975 through FY 1980, 18 facilities were turned over to the county government by MCPS. However, during the same time, about $33.3-million was invested in school renovations and additions to buildings. The energy staff believe that these alterations require more energy than did the schools which were turned over to the county.

Beginning in FY 1979, the cost of utilities began to claim a smaller portion of the total operating budget than in the previous three years.[1] Apparently energy management, even on its present small scale, is beginning to lessen the effects of rising utility costs on the operating budget.

Telephone Cost Increases

The use of the telephone in MCPS is high by any standards, and past efforts to increase employees' awareness of this drain on the budget have not been effective. It has been pointed out elsewhere that from FY 1975 to FY 1979 student enrollment decreased by 18 percent and the number of facilities in operation decreased by 9 percent. During that same period, however, the number of telephone message units increased by 21 percent and costs increased by 54 percent.

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[1] 1976, 3.59%; 1977, 3.94%; 1978, 4.06%; 1979, 3.83%; 1980, 3.78%

It has been suggested by some unit managers that if there has been a reduction in the use of MCPS vehicles and of private vehicles on MCPS business, there would probably be a corresponding increase in the use of the telephone. There would thus be a trade off of telephone costs for transportation costs. While this may be true, it is also true that use of the telephone for personal business is considered a "fringe benefit" by many MCPS employees and that such use is largely uncontrolled.

Findings: Staff Opinions

Exhibit 18.1 shows that school staff members feel they are making a good effort to conserve energy. On the questionnaires, 97 percent of the principals and 78 percent of the teachers reported that energy conservation had been a topic of at least one staff meeting, and all principals and 82 percent of the teachers said the staff was informed about specific ways to conserve energy. Principals (89%) and teachers (75%) said they believe that staff members are making an effort to save energy, but they also believe that students are not doing so. It is possible that the same efforts have not been made to enlist the cooperation of students as were made with staff and that reminders about energy conservation which are not presently displayed would be of some value.

Implications of Findings and Recommmendations

Energy and utility costs are now too great and too important to allow energy management to remain in the hands of a small staff which does not have control over all energy-related functions. A new organizational structure is badly needed (see Part V), and staff should have computer support. Accurate data are needed for management decision-making and to assure that energy bills are accurate. These considerations lead to the following recommendations:

- o Establish an energy analysis and monitoring division with adequate staff and computer support.
  - . Assign the division a place in the organization which coordinates facilities management (see Part V).
  - . Create the positions needed to carry out the complex energy management program.

- Involve principals, other unit managers, accounting staff, and computer staff in the search for better ways to monitor and evaluate the energy program.

- Develop guidelines for interpretation and use of utility data and review them annually with managers of each facility.

- Institute direct budgeting for telephones, beginning with a level of funding 10 percent below the FY 1981 level.

Exhibit 18.1

PRINCIPALS' AND TEACHERS' RESPONSES TO QUESTIONS ABOUT ENERGY CONSERVATION

Questions	Response/Respondents			
	YES		NO	
	Prin	Teach	Prin	Teach
(Has) conservation of energy been a topic of discussion or presentation in at least one faculty or staff meeting this school year?	97%	78%	3%	22%
(Was) staff informed at least once this school year about specific ways (to) conserve energy?	100%	82%	0%	18%
(Are) signs, displays or other reminders about energy conservation prominently posted in the school?	46%	24%	52%	74%
(Are) staff members making an effort to conserve energy?	89%	75%	9%	23%
(Do) students seem to be making an effort to conserve energy?	49%	42%	46%	56%
(Are) energy saving procedures enforced in your school?	NA[a]	64%	NA	34%
(Has) the school reduced its energy consumption during the past 5 years?	88%	NA	11%	NA
(Have) voluntary energy saving policies been effective in your school?	82%	NA	15%	NA

Rounding error by item and respondent group = +/- 2%. Small percentages of no-response not reported.

[a] NA= question not asked on given questionnaire.

CHAPTER 19

ENERGY AUDITING AND ENERGY MANAGEMENT

Introduction

At present, MCPS does not have sufficient data on which to base an energy management plan. It is not known, for example, how many malfunctioning thermostats there are in the schools or how many heating equipment controls are not properly adjusted. It is not known what modifications (some comparatively simple or inexpensive) might be made in buildings, equipment, or practices that could lead to a reduction in energy consumption and costs. Yet it has been shown in the literature that collecting data through energy audits and using the data for planning can lead to savings of 20 to 30 percent--as much as has been obtained in MCPS by computer control of equipment (see next chapter).[1]

Findings

Energy Auditing

The purpose of conducting energy audits is to improve the efficiency of heating, ventilating, and air conditioning equipment or of any other equipment or practice which consumes energy or affects energy consumption. An audit would include, but by no means be limited to such things as illumination readings, identification of equipment needing repair or adjustment, need for modifications like weatherstripping or insulation, identification of equipment or controls which should be replaced by more efficient or newer equipment, and so on. Also included are evaluations of environmental conditions like location, enrollment, etc.

Given data provided by an energy audit, an energy-saving plan can be developed for each school. For example, illumination levels might be lowered in home economics rooms used for cooking. Regular flourescent lamps might be replaced by low-wattage types for a saving of from 10 to 14 percent in consumption. Damaged thermostats could be replaced, or it might be recommended that thermostats of a new type be installed.[2]

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[1] American Association of School Administrators, "Saving Schoolhouse Energy," March, 1980.

[2] One type triggers the furnace or air conditioner only when the temperature is outside an acceptable band (instead of at a single given minimum temperature).

It should be mentioned that several years ago federal funding guidelines required school energy audits. The two people who are presently assigned to energy management had to conduct about 240 audits of different types (preliminary, energy, and technical) in six months. The energy staff say that because staff and time were limited, the audits were not performed in the detail necessary to yield complete and reliable data. Given full and reliable information, however, it is obvious that energy audits are essential to the development of both an energy-saving plan for each school and an overall plan.

Potential Savings

As was said in the introduction, if the information is acted upon, energy audits can produce reductions in consumption and costs equal to those realized in MCPS through computer control of equipment. The Michigan State University, for example, conducted energy audits, developed a data base, drew up a comprehensive energy plan, and implemented recommendations derived from the audits. It realized a 20 to 30 percent savings above any savings accomplished previously with other control measures.[3] The University of California spent $640,000 to equip 12 older buildings with acceptable-band thermostats (see footnote 2). The university's fuel consumption was reduced to 65 percent of what it had been in 1972-73 (35% reduction), and the payback time for the new equipment was less than three years.

Potential Costs

Obviously, it cannot be shown here that MCPS would realize major savings from energy auditing and implementation of recommendations which would stem from audits. However, there is every reason to believe that substantial savings are possible. In any case, a comprehensive energy monitoring and management plan cannot be developed without adequate data.

If a comprehensive energy audit of each facility were carried out every three years at a rate of one-third of the facilities per year, the energy staff estimate that it would take an additional three staff members. At an average of Grade 22, Step A, the annual salary and fringe benefit cost would be about $76,000. It should be noted that it is recommended elsewhere that 11 members be added to the energy staff. The three recommended here are included in that larger estimate.

It is possible, of course, that energy audits could be done by an outside contractor, and this alternative to an in-house staff should be investigated. However, it should be recognized that energy auditing is a continuous, not a one-time process. There must be very close cooperation and coordination among energy auditors, energy managers and monitors, equipment operators, maintenance mechanics, and managers of major MCPS units who deal in any way with energy. Contracting audits may not, therefore, fill all needs.

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[3] Michigan State University, American School and University, May, 1980. The university is smaller than MCPS. It has only 135 major buildings and an enrollment of 43,000.

Implications of Findings

Energy auditing can provide the data base necessary to the development and implementation of an overall MCPS energy management and monitoring plan. It gives promise of yielding reductions in energy consumption with resulting savings equal to those obtained from other methods of energy control. In fact, in the 87 elementary schools which are not air conditioned, energy audits rather than computer control should be the primary means of reducing consumption (see following chapter on computer control).

It is recommended in Part V that a Division of Energy Analysis and Monitoring be created under a new Department of Facilities Management. Implementation of this or a very closely similar organizational plan is essential to the success of energy management. Energy auditing produces the data needed for an energy management plan. However, the recommendations which result from energy audits would touch almost all units of MCPS. In particular, they have a bearing on maintenance and school plant operations functions, and it is therefore logical that the unit conducting the audits have a close association with maintenance and operations units.

Recommendations

- o Staff and funds should be allocated to the new Division of Energy Analysis and Monitoring (or similar unit) to conduct comprehensive energy audits of each MCPS facility.

- o A comprehensive energy plan should be developed on the basis of facility audits.

    - . The plan should be coordinated with the MCPS Comprehensive Facilities plan.

    - . It should predict costs and estimated savings.

    - . In should include a schedule for implementing recommendations.

- o The cost of contracting energy auditing should be compared to the cost of maintaining an in-house energy auditing staff, and the services of contractors should be compared to the services actually needed by MCPS.

CHAPTER 20

COMPUTER CONTROL OF EQUIPMENT

Introduction

In FY 1978, a computerized system was installed in five MCPS secondary schools to control heating, ventilating, and air conditioning equipment.[1] By the end of the 1979-80 school year, the system was to be extended to 14 schools. The purpose of this chapter is to show what energy savings have already been realized and to make some projections for the future. Data presented are necessarily limited to the original five schools on the computer system.

Findings

Reductions in Consumption

In FY 1979, all secondary schools reduced their consumption of energy. However, the following data show that the five schools on the computer system did so to a far greater extent than did the noncomputer schools:

	Reduction Fuel Oil	Reduction Electricity
Computer schools	38%	25%
All other secondary schools	9%	16%

If energy consumption in the noncomputer secondary schools and in elementary schools (but see later) decreased by the same percentage as in the computer schools, an estimated annual savings of $1,820,778 would be realized.

Generalizing Results

Despite the fact that the five pilot schools are secondary schools, there is good reason to believe that computer control can reduce energy consumption, and hence costs, regardless of school size. The basic computerized control procedures involve reducing demands for power during peak periods when costs are highest, reducing energy flow to unoccupied areas, and minimizing heating or cooling of outside air by restricting air flow. These procedures are essentially the same for all buildings.

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[1] Two senior high schools, two junior high schools, and one middle school.

It is true that the five schools were originally selected because they consumed large amounts of energy, and it was therefore assumed that significant reductions and savings were possible. However, the range in number of classrooms in the pilot schools (37, 48, 54, 64, 72) is the same as in other secondary schools. When number of classrooms is statistically controlled for, it turns out that the pilot schools were not the highest users of energy by classroom category. Furthermore, among the five computer schools, there was essentially no relationship between school size and the percentage of energy reduction as shown below.[2]

Number of Classrooms	Reduction Fuel Oil	Reduction Electricity
72	37%	23%
64	40%	29%
54	31%	24%
48	27%	20%
37	49%	32%

Even without computer control of plant equipment, reductions in the consumption of fuel oil and electricity have already been achieved in about 76 percent of the secondary schools and 60 percent of the elementary schools in the county, as shown in Exhibit 20.1. A larger percentage of schools made reductions in the consumption of fuel oil than of electricity, and a larger percentage of secondary schools than of elementary schools made reductions in consumption of both fuel oil and electricity.

The findings suggest that reductions in consumption of energy, and therefore in costs, can be obtained by computerized energy management in secondary schools. This is also true for air-conditioned elementary schools, in which savings can be realized through the reduction of demand for electricity. In other elementary schools, reductions in the consumption of energy might better be made by implementing measures recommended by energy audits.

Cost Estimates

It was estimated that if computer controls were installed in all secondary schools and in air-conditioned elementary schools (a total of 101 schools), the one-time installation cost would be $3,030,000. However, it was stated previously that additional staff are needed in energy management. The present energy staff estimate that eight staff members would be needed to make program changes, examine and follow-up computer printouts, deal with school complaints, and provide other services to the schools. Three would be needed

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[2] Spearman rank-order correlations are very low, negative, and nonsignificant.

Exhibit 20.1

PERCENTAGES OF SCHOOLS IN WHICH THE CONSUMPTION OF FUEL OIL AND ELECTRICITY INCREASED OR DECREASED BETWEEN FY 1977 AND FY 1979

Type School/ Energy Type	Lower in FY 1979[a]	Higher in FY 1979[a]
ELEMENTARY SCHOOLS		
Fuel Oil	65%	35%
Electricity	56%	44%
Combined (Oil+Electricity)	60%	40%
SECONDARY SCHOOLS		
Fuel Oil	89%	10%
Electricity	63%	37%
Combined (Oil+Electricity)	76%	24%

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[a] As compared to consumption in 1977.

for the energy audit program (see the previous chapter). Assuming average salary and benefits (FY'81) at Grade 22, Step A, continuing annual salary costs would be $278,850. An additional annual amount of $175,000 would be needed for travel expenses, supplies, and selected consultant services. Total energy management costs would be $453,850 annually.

The one-time computer installation cost of $3,030,000 and the energy management costs combined equal $3,483,850. If the estimated annual saving of $1,820,778 were realized, installation costs would be paid back in less than two years. By the third year, savings would exceed annual management costs by $1,366,928. However, payback periods for installation will differ by facility size, and it is possible that a greater return on the investment dollar might be made possible by installing computer controls and extending the staff buildup over more than a one-year period.

Recommendations

- All schools should undergo an energy audit.

- If justified by the energy audit, all secondary schools and air-conditioned elementary schools should be put on a computer controlled energy management system The energy management staff should determine the optimal installation time period overall and by individual facility.

- The energy management staff should be substantially increased.

CHAPTER 21

NATURAL GAS: AN ALTERNATIVE SOURCE OF ENERGY

Introduction

This chapter discusses the possible use of natural gas in place of fuel oil in MCPS facilities, because natural gas is now the cheaper of the two. Other sources of energy should also be considered, and the energy management staff should be given the resources to explore them. In addition, heating, ventilating, and air conditioning equipment should be designed to accommodate different fuels so advantage can be taken of varying market conditions. This capability does not exist at present because fuel costs did not have the same impact on the budget a number of years ago that they now have. Earlier decisions, for example, to build all-electric schools were made before the large increase in the cost of electricity. There is no readily available substitute for electricity under these conditions. Again, therefore, discussion will be restricted to natural gas as a substitute for fuel oil.[1]

Findings

Savings With Natural Gas

During recent years, natural gas has become less expensive than fuel oil, and savings are possible if gas can be used in place of fuel oil in a reasonably large number of schools. To obtain an estimate of savings, comparison was made of the cost of fuel in three MCPS elementary schools that used only natural gas and the cost in three elementary schools that used only fuel oil. The schools were comparable in size, enrollment, and year of construction. Results were as follows:

	Total Cost	Average Per School
Fuel oil only	$28,653	$9,551
Natural gas only	$18,657	$6,219
Difference	$ 9,996	$3,332

The total fuel cost in the schools using natural gas was only 65 percent of the cost in schools using fuel oil. To look at it in another way, if the schools now using fuel oil were to change to natural gas, fuel costs would be

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[1] In FY 1981, the use of solar energy will be piloted at one MCPS middle school. It is assumed the investment will be paid back in 20 years.

Exhibit 21.1

POSSIBLE SAVINGS IF ALL FUEL OIL WERE REPLACED BY NATURAL GAS

Level	Gallons of Fuel Oil Used in FY 1979	Cost of Fuel Oil in June, 1980*	Cost of Equivalent Amount of Natural Gas in June, 1980	Possible Savings	Total Possible Savings by Level
Elementary-No. 2 Fuel	832,167	$ 725,317	$432,727	$292,590	
No. 5 Fuel	1,505,986	$1,150,272	$783,113	$367,159	$659,749
Secondary-No. 2 Fuel	787,583	$ 655,401	$409,543	$245,858	
No. 5 Fuel	2,937,749	$2,243,853	$1,527,629	$716,224	$962,082
Central- No. 2 Fuel	74,527	$ 62,019	$ 38,754	$ 23,265	
Offices No. 5 Fuel	74,312	$ 56,760	$ 38,642	$ 18,118	$ 41,383

*This quotation of fuel oil was made in June, 1980. The delivered rather than the pick-up price is reported since natural gas requires no MCPS tank delivery system. Fuel oil delivered prices were .8716 for No. 2 fuel and .7638 for No. 5 residentual oil. An equivalent price of .52 per gallon was used for natural gas.

Opportunities for substituting natural gas for electric likely exist in those facilities which are not designed with a dependence on electric power. Cost savings would be much higher when natural gas is substituted for electric.

reduced by 35 percent (assuming they used the same amount of fuel as the schools now using natural gas).

If the difference between the cost of natural gas and fuel oil continues in the future, substantial savings are possible as shown in Exhibit 21.1. In elementary schools, $659,749 could be saved; in secondary schools, $962,082; and in central offices, $41,383. The total estimated savings would be $1,663,214.

Costs and Payback

Exhibit 21.2 shows investment cost estimates for converting from fuel oil to natural gas and estimated payback periods. The cost for converting 137 elementary schools to natural gas would be paid back in between 2.5 to 6.2 years. In secondary schools, costs would be paid back in between 1.0 to 2.5 years. Costs for converting at the central offices would be paid back in between 2.6 to 6.5 years. Making the conversion in secondary schools is particularly attractive. First, each year 60 percent of the fuel oil purchased is used in secondary schools, which represent only 27 percent of all facilities. In addition, conversion costs in proportion to the amount of fuel oil used are lower in secondary than in elementary schools.

Short-Range Problems

There are some short-range problems associated with large scale conversion to natural gas. The Washington Gas Light Company is reported to be inundated with requests for conversions and may not provide quick service. The energy management staff reported that they asked the company to provide service to 11 schools but that there has been no follow-up on the request for two years. Therefore, investment in conversion may not be advisable if Washington Gas Light will not guarantee that work would be done in a reasonable time. It is possible, of course, that the company might be influenced by a formal request for large scale conversion.

Another problem is that while most schools already use natural gas for some purpose, 39 schools do not use it at all. This may be because there are no nearby gas lines, though there are other possible reasons. If gas lines must be installed, the company sometimes passes the cost on to the customer. The cost may be small for a large user like MCPS, but it should be determined in advance if a charge will be made and whether or not it will be an important cost consideration.

Long-Range Considerations

The long-term national supply and price of natural gas seem favorable at present. The Washington area uses "old" natural gas from Texas and Louisiana, the price of which is regulated. While some deregulation may occur, it is estimated that gas prices will remain 20 to 30 percent below the price of oil through the year 2000.[2]

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[2] American Gas Association, "Terra Analysis Total Energy Resource Analysis Model" November, 1979.

Schools and residences are given high priority classification. In the event of a shortage, gas supplies to other users can be curtailed and directed to high priority use. Therefore, high priority users are not expected to experience shortages during the next two winters even if a demand equal to that of the winter of 1976-77 should occur. Furthermore, the Federal Energy Regulatory Commission says that natural gas supplies will improve, that they will be substantial, and that there will be only a moderate increase in demand for natural gas. There is, then, apparently good reason to assume both advantages and long-term availability of natural gas.

Implications of the Findings

Apparently, there is a very large potential payoff in converting all MCPS facilities to natural gas. In addition, there would be a certain amount of protection from the vagaries of the oil market. However, the findings presented here are preliminary and based on a small number of cases. Large-scale conversion to natural gas should therefore not be undertaken without a full study of benefits, costs, and payback.

Recommendations

o Conduct a cost and benefit study.

  . Examine a sample (which permits generalizing to all MCPS) of currently used heating, ventilating, and air conditioning equipment.

  . For each type of equipment, establish reliable estimates of the cost of converting to natural gas.

  . For each type of equipment, identify the amount of fuel consumed per year, amount of natural gas which would be consumed, cost savings, and payback period on investment.

o Prepare a formal request to the Washington Gas Light Company, asking that the company provide information about the status of gas lines currently available to MCPS, connection charges if new or larger lines are needed, a schedule for making a large scale conversion, and projected costs of natural gas through the year 2000.

o If it is determined (by above steps) that conversion is desirable, prepare a detailed proposal for large scale conversion.

Exhibit 21.2

INVESTMENT COSTS AND PAYBACK PERIODS FOR REPLACEMENT BURNERS WHICH CAN USE FUEL OIL AND NATURAL GAS

Level	Number of Facilities	Assumed Average No. Burners	Burner Replacement Costs		Years for Payback on Investment	
			At $6,000 Each	At $15,000 Each	Low Cost Estimate	High Cost Estimate
Elementary	137	2	$1,644,000	$4,110,000	2.5	6.2
Secondary	54	3	$ 972,000	$2,430,000	1.0	2.5
Central Offices	6	3	$ 108,000	$ 270,000	2.6	6.5

* Fuel oil and natural gas are used in a variety of heating, ventilation, and air conditioning equipment. The primary costs of converting to the use of natural gas are described as due to the replacement of burners which now use only fuel oil to those that use either fuel oil or natural gas so that MCPS can take advantage of market conditions in future years. A detailed equipment study may show there are additional costs necessary to the conversion. The estimated costs for burner conversion range from $6,000 to $15,000 each.

PART V

OVERVIEW OF CENTRAL MANAGEMENT

CHAPTER 22

INTRODUCTION AND A MANAGEMENT MODEL

Introduction

This part of the report presents an overview of central management of maintenance and school plant operations functions and makes recommendations for reorganizing management derived from the findings presented in detail in Parts II, III, and IV. The purpose is to give a synoptic view of management which cannot be seen when the Maintenance Division and School Plant Operations are looked at as separate units.

A Management Model

Some type of management model must exist against which the specifics of MCPS functions can be asessed. The literature of business and public administration abounds with such models, many of which are extremely complex. Therefore, the MORE project staff in the Department of Educational Accountability adopted for these studies a simplified model which divides the responsibility of management into just three categories as follows:

- Strategic Planning

  This includes setting objectives, establishing procedures for meeting the objectives, and planning for the acquisition and distribution of resources needed to meet the objectives. In evaluating performance, the auditor would look at such things as the availability and use of data, priority setting, feedback mechanisms, integration of objectives, and the length and predictability of the planning cycle.

- Resource Control

  This addresses how effectively and efficiently resources are used, whether outcomes match objectives, and whether adequate controls exist. Evaluation would include checks and balances, feedback, span of control, productivity, quality control, and resource control.

- Operations control

  This encompasses how effectively and efficiently the functional tasks of the unit are carried out. The management audit would look at things such as work loads, assignment of work, on-the-job supervision, inspection of work, quality of completed work, feedback, and user satisfaction with the work.

A model of this kind permits taking separate specific findings from various parts of the management audit, relating them to obtain a larger picture of the management operation, and evaluating that overall picture. Appropriate recommendations can then be made. The remainder of this report carries out this evaluation-recommendation process for the management of maintenance and school plant operations functions.

CHAPTER 23

CENTRAL MANAGEMENT: FINDINGS AND RECOMMENDATIONS

General Management: Summary of Findings

Exhibit 23.1 presents a summary of study findings from Parts II and III which have significant implications for the overall management of maintenance and school plant operations functions as described in the model in Chapter 22. There are severe deficiencies in all three management responsibilities: strategic planning, resource control, and operations control. There is no overall planning process, though some strategic planning does take place and some controls are exercised. But each is a separate piece of what should be a comprehensive process, and little of the planning is based on accurate data collected as feedback from resource control or operations control.

Most planning of whatever kind stops with the adoption of the MPCS operating budget. If the budget allocation is too low, a specific maintenance or custodial function could be terminated for lack of critical personnel or supplies during the year. This approach is expedient, but it is not sound planning.

In both resource and operations control, necessary information either does not exist or is not readily available to management in a form that can be used. Inspections of work are limited. Controls over supplies and materials are lax at best and often do not exist. Standards of most kinds also do not exist or are so affected by outside factors as to be meaningless.

Some of the reasons for these findings can be identified. There are few managers, especially in the Maintenance Division, relative to the size of the staff and the number and variety of tasks being managed. Computer support has never been given to managers of maintenance or school plant operations functions despite the fact that repetitious record keeping of the kind the units need is ideally suited to computerization.

It is important to note that in spite of these deficiencies, MCPS has been able to maintain a fairly high level of maintenance and school plant operations services. But the school system has accomplished this by concentrating on a single management function: operations control.

Merger or Restructuring: Summary of Findings

Applying the management model to the separate findings in the Maintenance and Operations studies does not, in itself, make it possible to arrive at a comprehensive solution to the problems involved. It is also necessary to

Exhibit 23.1

IMPLICATIONS OF STUDY FINDINGS FOR MANAGEMENT

Summary of Study Findings	Finding Has Implications For		
	Strategic Planning	Resource Control	Operations Control
MAINTENANCE			
o Regardless of changes in service since decentralization, 66 percent of the principals said they are satisfied or very satisfied with the overall performance of the Maintenance Division.			X
o A majority of principals and teachers who were surveyed said that maintenance service has stayed the same or gotten worse since decentralization.			X
o The decentralization of the Maintenance Division has not been carried out as intended.	X	X	X
o Under decentralization, there has been a loss of mid-level supervision, but a possible improvement in working relationships between area depot supervisors and area associate superintendents.	X	X	X
o Neither School Facilities nor the Maintenance Division collects, has available, or analyzes critical planning information.	X		
o There is no system for establishing task priorities or scheduling, and priorities may be determined at different levels by almost anyone in the Maintenance Division.	X		X
o There is no real preventive maintenance program.	X		X
o There is no regular inspection and reporting system.		X	X
o There is no regular system for checking with principals on the completion and adequacy of work performed at schools.		X	X
o Principals and building service managers report that there are often more workers sent to the school than are needed to get the work done.	X	X	X

Exhibit 23.1
(continued)

Summary of Study Findings	Finding Has Implications For		
	Strategic Planning	Resource Control	Operations Control
MAINTENANCE (Continued)			
o Work orders are considered little more than a means of dispatching workers, with little recognition of their potential value for planning and control.	X	X	
o There is some evidence of understaffing at the managerial and secretarial-clerical levels.	X	X	X
SCHOOL PLANT OPERATIONS			
o Recognizing that the principal is also the supervisor, 86 percent of the principals said they are satisfied or very satisfied with the work of the building services staffs in performing routinely scheduled jobs.			X
o The direct management of the building service staff is primarily the responsibility of the principal, although the technical expertise rests with the operations managers.	X	X	X
o Many essential tasks are not a part of the building service workers' schedules, and many jobs are not done.			X
o In comparison with nearby counties, MCPS has the smallest average number of workers per school, and they are responsible for the second highest pupil load of all counties studied.	X	X	X
o Area operations supervisors do not visit all schools in their areas on a regular basis.	X	X	X
o Although area supervisors are responsible for helping building service managers develop work schedules, the supervisors do not maintain up-to-date copies of those schedules.	X	X	X
o There is no Division of School Plant Operations.	X	X	X

Exhibit 23.1
(continued)

Summary of Study Findings	Finding Has Implications For		
	Strategic Planning	Resource Control	Operations Control
SCHOOL PLANT OPERATIONS (Continued)			
o There are no countrywide work standards against which the performance of the building service staff can be judged, and no standards of cleanliness or housekeeping effectiveness against which the condition of schools can be judged.		X	X
o There are no minimum tasks lists which must be accomplished regularly in each school.	X	X	X
o Managerial control over building service staffs is rather loose.		X	X
BOTH FUNCTIONS			
o There is a lack of control over supplies and materials: procurement, testing, inventory, distribution, and portion control.	X	X	
o Work standards do not exist.	X	X	X
o Managers generally believe that work standards are unnecessary.	X	X	X
o What planning exists tends to stop when the budget is adopted. If money runs out during the year, staff are instructed to stop providing the related service. No attempt is made to balance work throughout the year, or to prioritize needs.	X		X

consider the relationships among the various functions and to explore alternatives to the present organizational structure. Among the findings which show the need for organizational change are the following:

- Planning and scheduling of capital projects is carried out largely independently of the Maintenance Division even though the division's staff and resources are ultimately included in some capital projects.
- The current division of responsibilities between the Maintenance Division and School Plant Operations is not always specified or clear.
- The separation of energy management from maintenance has resulted in coordination problems in carrying out essential services.
- In general, formal communication and feedback mechanisms among units do not exist.
- The literature of the field makes little distinction between maintenance and school plant operations functions. Many articles warn against creating such a distinction and point out instead that the actual situation is a continuum from routine housekeeping to major maintenance projects.
- Within MCPS, the functions are not only separated but are assigned to different departments. Coordination depends on voluntary cooperation of managers or on intervention by the associate superintendent for supportive services.

Implications of Findings

Whether or not any formal merger or restructuring of units is to take place, the current management system, objectives, and processes do not provide sufficient clarification of functional roles and coordination of activities within and among units. At a minimum, clarification and coordination must be sought for maintenance, school plant operations, energy management, and capital projects and construction. In addition, sound management practice requires the institution of proper checks and balances. Controls are necessary to assure efficient and effective handling of hundreds of thousands of dollars worth of supplies and equipment.

In several respects, MCPS has a successful maintenance and school plant operations program. Carrying out functional service tasks has been cited as the area of strongest performance in recent years, and users of services are generally more satisfied than not with the service they get (though allegations of waste and inefficiencies were made by various study respondents). The successes are the result of major dependency on factors like the following:

- o It is reported that a stable work force of skilled mechanics has required minimal supervision and control.
- o Managers have been promoted from the ranks of workers and are trade and task oriented.
- o There has been a mutual trust between supervisors and workers.
- o Established personal relationships among key directors and supervisors have reduced the need for formal communications and feedback mechanisms.
- o There is an extensive accumulation of information and experience in the heads of a few key managers.

These attributes are admirable and may have been highly successful during the period of the growth of MCPS. However, just as MCPS is changing in other ways to adjust to declining enrollment and shrinking resources, so too must new management attitudes, structures, and procedures be created for the service functions of the school system.

Under present circumstances it is impossible to verify the quantity and quality of the work performed or to determine the true cost to MCPS of performing tasks with an in-house work force. It also became apparent through the study that some managers consider planning, control, and accountability low priorities. The implication is that the benefits of developing and implementing standards and controls would not equal the perceived benefits. One is frequently left with the feeling that some important actions have intentionally just not been gotten around to.

A Recommended Organizational Structure

The first step in changing direction is to establish a new structure for the management of maintenance, school plant operations, and related functions. The recommendations made here are for an overall management structure only, which can and should be created regardless of later decisions about the actual delivery of service. The findings of this study point to the formation of a new MCPS Department of Facilities Management which would include three divisions: (1) Division of Maintenance and Operations, (2) Division of Energy Analysis and Monitoring, and (3) Division of Capital Projects and Construction.

The Division of Maintenance and Operations would combine the two existing functions of maintenance and school plant operations. A high degree of coordination is essential for maintenance and operations if MCPS is to recognize these functions as parts of a continuum rather than as distinct entities, and if the school system is to institute better preventive maintenance, new management controls, and greater accountability. However, merger of the management of these two functions must also take into account both the scope of management responsibility and the range of technology which will be encompassed by this division. Additional management support, beyond the director's position, will be essential, either in the form of an assistant director (as the Maintenance Division has now) or coordinators for specific functional areas.

The Division of Energy Analysis and Monitoring would represent an elevation in rank, importance, and visibility of the present energy management staff, which now functions under the Department of School Services. The present staff is quite small, and staff members work more in isolation from than in cooperation with other key units. Since energy control is largely carried out at the facility level, and since the primary focus of the new division would be on facilities, energy management fits into the new Department of Facilities Management.[1]

The Division of Capital Projects and Construction is the only unit suggested for inclusion in the new department which is not included in the FY 1980 MORE studies. However, it is already clear that maintenance and capital projects are not easily separated. Maintenance, operations, and energy management staff must have a larger voice in capital projects planning to assure the most efficient designs for new or renovated facilities.

Other Functions

Including the functions just identified in the new Department of Facilities Management raises questions about three other functions: joint occupancy, school security, and educational facilities planning. The following discussion of each function is intended only to raise questions about possible future directions.

The joint occupancy program is managed by a small unit which is currently a part of the office of the director of the Department of School Facilities. It could serve the same function in the new Department of Facilities Management. However, consideration should also be given to placing it with other MCPS financial and business units, since its primary functions are procurement of lease holders and management of the leases.

The School Security Office is also assigned to the Department of School Facilities. The obvious relationship among security, the schedules of building service workers in the schools, and 24 hours facilities management raises a question about the present administrative placement of the unit. There is thus little doubt that the security function would belong with the new department. The only question is whether it should be directly under the department director or under the director of the new Division of Maintenance and Operations.

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[1] Implementation of energy management policies and control of energy consumption and costs should also be made the responsibility and goal of all units and unit managers. Managers should be held accountable for failure to enforce procedures or for excessive use of energy, but only when energy use is within their control.

Educational Facilities Planning obviously involves school facilities and has an impact on maintenance, school plant operations, and captial projects. However, it is recommended at this time that no change involving this unit be made. A future MORE study will examine all planning functions in MCPS, and undoubtedly recommendations relating to this issue will be made at that time.

Department of School Facilities

All of the current functions of the present Department of School Facilities would be transferred into the new Department of Facilities Management if the plan presented here were adopted. In order to promote the concept of a new management approach, it is strongly recommended that the existing department should clearly be dissolved. The new department should then be formed or reconstituted from the beginning to avoid giving any appearance of only renaming and modifying what already exists. Present members of the School Facilities staff would be able to apply for positions in the new department through normal personnel procedures.

Department of School Services

The current school plant operations and energy management functions would be transferred from the Department of School Services to the recommended new department. Other current functions would remain in School Services: transportation, procurement, supply management, school food services, and safety. This would result in a reduced span of control for the department director, which would be beneficial because of several new objectives which are being established for the Department of School Services: furniture and equipment inventory responsibilities in supply mangement, full implementation of new procurement procedures, and so on.

Recommendations: Management Objectives

Within the recommended structure of the new Department of Facilities Management, directors will need to build on current strengths in operations control while developing new approches to strategic planning and resource control. Until more information is available and greater accountability is established, implementation and costing-out of more specific recommendations presented in this report will be difficult or impossible. Therefore, the following should be the primary objectives:

- Implement the new management structure.
  - Amplify the objectives presented here and identify quarterly dates for completion of individual goals over the next three to four years.
  - Make plans for assuring a comprehensive management approach to the functions of the new department, including provisions for regular and frequent meetings of the four directors.
- Develop and implement a comprehensive planning process for facilities management.
  - Expand current budget planning and capital projects planning to include all facets of facilities management planning.
  - Develop task and work standards.
  - Develop a preventive maintenance program with independently identified resources and feedback mechanisms from operations and resource control.
- Complete the decentralization of maintenance, especially of supply and equipment inventory, storage, and delivery.
- Begin collecting data on current tasks.
  - Data potentially available from the current maintenance work orders (especially time and cost data) should be uniformly collected with strict enforcement of the process.
  - Similar data should be collected for Operations tasks.
  - Provide computer support to facilitate data analysis and feedback.
- Complete the energy management plan and begin its implementation, using the recommendations in this report and the draft report from the staff committee.

Exhibit 23.2

COMPARISON OF EXISTING AND PROPOSED CENTRAL FACILITIES MANAGEMENT STAFFING[a]

Existing Positions

DEPARTMENT OF SCHOOL SERVICES:

- Director of School Services
- Energy Management Specialist

DEPARTMENT OF SCHOOL FACILITIES:

- Director of School Facilities
- Director of Maintenance
- Director of Construction and Capital Projects
- Assistant in School Facilities
- Assistant Director of Maintenance
- Assistant Director of Construction and Capital Projects[b]
- Site Administrator

TOTAL POSITIONS = 9

Proposed Positions

DEPARTMENT OF FACILITIES MANAGEMENT:

- Director of Facilities Management
- Director of Maintenance and Operations
- Director of Energy Analysis and Monitoring
- Director of Construction and Capital Projects
- Assistant in Maintenance and Operations (2)
- Assistant in Construction and Capital Projects[b]
- Site Administrator

DEPARTMENT OF SCHOOL SERVICES:

- Director of School Services

TOTAL POSITIONS= 9

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[a] Excludes secretarial, clerical, accounting, and special functions personnel.

[b] Funded in the capital budget.

- o Establish controls and accountability procedures throughout units of the new department. The controls should include the following:
    - . Procurement, distribution, use, and inventory of supplies and materials
    - . Information about time-on-tasks
    - . Supervision of work with regular inspections
    - . Enforcement of existing regulations on school plant operations work plans and maintenance job request folders
- o Investigate alternative structures for the delivery of unified maintenance and operations services to the schools.

Meeting these objectives will require managers who have knowledge and experience in their technical fields, who understand the importance of management standards and controls, who are experienced in developing planning and feedback procedures, and who are accustomed to working in situations in which the emphasis is on high levels of productivity and efficiency. These attributes are present in some current managers and supervisors but noticeably absent in others. Therefore, the new management structure will probably have to be staffed by a mixture of internal and external personnel appointments.

Potential Costs and Savings

As is mentioned throughout this report, too much of the data necessary for cost analysis was missing or not available in a useful form. However, two cost analyses are possible in relation to overall management and its objectives: (1) staffing and (2) potential savings from improvements in productivity, controls, planning, and accountability.

Staffing

Currently the MCPS operating and capital budgets provide nine administrative positions for the central management of the various functions discussed in this overview. (See Exhibit 23.2.) Two of these positions are in the Department of School Services and seven are in the Department of School Facilities. Implementation of the recommended management structure would also require up to nine positions, as many as eight of them in the new Department of Facilities Management and one, the director, in the Department of School Services to manage the functions remaining there.[2]

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[2] Since this MORE study does not review the functions of capital projects and site administration, the three administrative positions associated with those functions are included here. However, the coming MORE study of these functions could result in recommended changes.

Exhibit 23.3

POTENTIAL SAVINGS FROM GREATER EFFICIENCY IN MAINTENANCE AND OPERATIONS
(FY 1981 appropriations)

Item	Budgeted FY 1981	1% Saving	5% Saving
Operations salaries	$13,656,503	$136,565	$682,825
Maintenance salaries	7,544,897	75,449	377,245
Operations supplies	353,609	3,536	17,680
Maintenance supplies	1,047,200	10,472	52,360
Total potential savings		$226,022	$1,130,110

Secretarial-clerical and accounting positions for the proposed department could be reconstituted from the existing units and budgets. Personnel associated with special functions such as school security and joint occupancy would continue in those functions.

This analysis suggests that unless future reductions result from the capital projects/site administration study, there will be no change in the total number of central management positions, though the reconstitution of positions would be necessary. Therefore, no savings are achieved but no new costs are incurred from creation of the new department or from the consolidation of maintenance and operations into one division (with the exception of individual variations in the ultimate hiring levels for the positions).

Productivity

Management theory predicts that improved efficiency and effectiveness will result from increased supervision, planning, and control--from the "discovery" of previously unidentified accidential waste and lost time, if for no other reason. Exhibit 23.3 shows that the total potential savings for every 1 percent improvement in staff efficiency and 1 percent reduction in waste of supplies approaches $250,000 (based on FY 1981 appropriated resources for Maintenance and Operations alone). Thus, if the new management approach were to result in a 5 percent improvement in staff efficiency and use of supplies (a not unrealistic gain based on examples from maintenance and operations literature), the potential savings would be $1,130,110. Of course, such "savings" are entirely theoretical because they are based on a general approach, the results of which cannot be known at this time. If savings were actually realized, they could be redistributed in any of the following four ways:

- To meet development and implementation costs involved in accomplishing the savings
- To reduce the actual level of resources appropriated when possible
- To absorb new tasks or perform existing tasks more effectively without increasing the level of appropriate resources
- To improve the instructional program through a transfer of resources

Future MORE Study

Parts of the original study design could not be carried out because data were not available. However, implementation of these recommendations should lead to very specific actions which will yield data in the future. It will be important for another MORE study to evaluate the results of the recommendations which have grown out of this present study and to complete the original design. Therefore, the MORE schedule should be cylical, and in three to four years, the Department of Educational Accountability should restudy the facilities management functions.

PART VI

ALTERNATIVES FOR DELIVERY OF SERVICES

Chapter 24

ALTERNATIVES FOR DELIVERY OF SERVICES

Introduction

Thus far this report has presented specific findings, problems, and recommendations which will have to be addressed by any management group regardless of what decisions are made about long-term implementation of the recommendations. Among the specific recommendations are some which should, if implemented, lead to the collection and analysis of currently missing data which are needed to enable managers to make those long-term decisions. Therefore, until the new Department of Facilities Management is established and given the time and opportunity to address immediate areas of concern, it would be premature to recommend a single new strategy for the merged delivery of maintenance and operations services.

However, this report would be deficient if it failed to present some of the alternative strategies for delivering services which were discussed during the study and which new managers may wish to consider. Therefore, this chapter presents three possible alternatives for organizing maintenance and school plant operations services and suggests interim steps for data collection and decision making.

Some basic asssumptions underlie this presentation. First, it is assumed that the recommendations made in Part V will be accepted and implemented and that maintenance and school plant operations tasks will continue to be performed primarily by MCPS staff members (as opposed to outside contractors). It is also assumed that school administrative areas will continue to exist, though the number will be reduced. Finally, it is assumed that energy management plans within schools will be carried out largely by building service and maintenance workers.

Alternative One: Expanded School Maintenance-Operations Staff

Under this alternative, two major preliminary organizational steps would be taken: (1) A certain number of maintenance positions and virtually all building service positions would be converted to school-based maintenance-operations positions, increasing the number of workers per school. (2) A central maintenance work force would be established to provide specialized and/or major maintenance service to all schools. The following would then characterize this plan:

- o School-based workers would be responsible for all lower-echelon maintenance and general repairs and for many aspects of preventive maintenance.
  - . A single building manager would supervise the staff under the management of the principal.
  - . Work would be performed in accordance with countywide standards developed and monitored by the Division of Maintenance and Operations.
  - . The central maintenance staff would be called in only for special functions, major repairs and renovations, or jobs that must be done by a licensed mechanic (if no one on the school staff has the license).
- o Each administrative area would have an area supervisor of maintenance-operations who would provide technical assistance and planning to principals and building managers, and who would provide a management link between central office directors and the schools. Some additional assistance would be needed by these area supervisors as discussed in Part II, Chapter 7.
- o Some small elementary schools and special facilities might have to be paired to justify sufficient staff to carry out both maintenance and operations tasks. Coordination would be the responsibility of the area supervisor.

One of the major advantages of this system would be that services would be provided primarily at the schools and would be immediately available. Above systemwide minimal work standards, each school could adjust its internal facilities plan to meet its own needs and priorities. Finally, the system as a whole would be developing a greater number of general workers while retaining specialized capabilities.

A disadvantage would be that workers still might have to be "pulled" from one school to work in another if there were emergencies requiring an expanded staff or in cases of absenteeism. In elementary schools, it could be difficult to provide a large enough staff with enough critical skills to carry out the basic maintenance-operations program. There would be few promotional opportunities outside the individual school because the number of midlevel management and supervisory positions would be limited.

Alternative Two: Roving Crews

In this plan, maintenance and operations staff positions would also have to be reassigned. The organization would be as follows:

- In-school staff would be reduced to the minimum number required to provide only essential regular daily or weekly services.
- General maintenance crews would be formed by reassigning existing maintenance and some building service positions.
  - Each crew would be assigned to a group of schools and would visit the schools on a regular schedule.
  - Maintenance trucks or converted school buses would travel with the roving crew and provide shop facilities at the school.
  - The school-based staff would collect all requests for service between visits of the crew, and all work would be performed in concentrated periods.
- Area maintenance-operations supervisors would coordinate crew schedules and provide technical assistance. They would require area assistants as under the first alternative.

The advantages of this plan are that each crew could include more technical specialists than would be available on any one school staff, and school size would not be related to level of service rendered. Crew supervisory positions and building service manager positions in each school would provide promotional opportunities. Emergency service and covering for absentees could be handled rather easily.

The general logistics of this alternative would be more complex than in either of the other plans. Schools would have less opportunity to tailor a maintenance-operation plan to fit individual needs or priorities. Many maintenance problems which might be minor initially could increase in magnitude between visits of the crew.

Alternative Three: School Clusters

The following would be done in this plan:

- Each school would be assigned to a geographic cluster
  - The size of clusters would vary according to location, enrollment, condition of buildings, etc.
  - A tentative suggestion is that each high school be the nucleus of a cluster and house the cluster manager and the tools and supplies for the cluster (though it has been pointed out that there would be security problems).

- Existing operations staff and selected maintenance mechanics would be divided among clusters.
  - All maintenance-operations services would be performed by staff assigned to the cluster rather than to the school.
  - A cluster manager would supervise all services, and the principal would no longer be the manager of the building service staff.
  - A minimum staff under a work leader would normally remain in each school to provide repetitive cleaning and plant operations tasks
- Area supervisors would be retained to avoid putting central staff in the position of having to control 22 separate clusters.
  - Area responsibilities would include more management and supervision and less technical assistance.
  - An assistant area supervisor would not be necessary.

Under this alternative, maintenance-operations plans could be closely tailored to individual school needs within the cluster, but there would be flexibility to meet emergency needs and to cover for absence. A midlevel supervisory structure (and therefore promotional opportunities) would be created. Each cluster work force would be large enough to include a range of specialists, especially a plumber and an electrician to perform work which must be done by a licensed mechanic.

The principal disadvantage would be that the current role of the principal in managing all direct services would be significantly altered. Though some principals said on the questionnaire that they might prefer some such alternative, most said they want to manage building services. Therefore, this plan would require more extensive communication and cooperation among all units than would the others.

Cost Analysis

In the course of the study, the cluster plan received more preliminary support from some managers than the other two alternatives, though this support is not necessarily evidence that it is the best plan. Comparison of the advantages and disadvantages of the three plans tends to support the greater interest in this strategy. For this reason, and because this alternative represents the greatest change from current practices, a preliminary cost analysis of the plan was made to provide some idea of what savings, if any, might be expected from an alternative method of delivering services.

Currently, there are 188 building service manager positions of various grades and 5 area supervisor positions which would be eliminated under the cluster plan. Using an average salary of Step D for each grade level, these 193 positions require $2,663,683 in current salary resources.

If the tentative assumption of one cluster for each high school is maintained, then 22 cluster managers would be required. The grade level of such a new position is an unknown. A Grade 16 would be two grades higher than that of the building service manager in the largest high school but still lower than that of a present area supervisor. At Grade 16, Step D, the 22 cluster managers would earn $385,286.

To avoid reducing the total work force available to the schools, it is assumed that the 171 building service manager positions not reconstituted as cluster manager positions would be reconstituted as regular building service worker positions at Grade 8. The total salary for these 171 worker positions would be $2,094,921. Therefore, the combined salary costs for the 193 reconstituted positions would be $2,480,207. This amount represents a savings of $183,476 over current operations staffing. These calculations are summarized on Exhibit 24.1.

Salary costs for maintenance workers brought into the cluster work force are not calculated because it cannot be determined at this time which maintenance craftsworkers would be needed centrally and which would be needed in the clusters. The assumption is that collectively they would average the same grade and salary level as they do currently. In fact, elimination of a few maintenance craft leaders in favor of the cluster manager might create a modest additional savings. By the same reasoning, other building service workers (including the necessary 188 work leader positions) who are not included in these cost figures are assumed to remain at the same grade and salary level under both the existing and alternative structure.

Recommendations

As discussed previously, it would be premature to recommend any one of the alternative strategies outlined here because there are presently insufficient data and no detailed cost-and-benefit or feasibility studies have been done. However, all of the alternatives presented here, and perhaps especially the cluster plan, should be thoroughly investigated. The examples given here suggest that some steps must be taken before any alternative can be evaluated, recommended, or implemented. They are the following:

- o Implement the merger of units at the central office level, but not in the delivery of service.
    - . Until a strong management unit is in place and comprehensive planning is begun, specific recommendations on the merged delivery of services would be premature and possibly inaccurate.
    - . Operational recommendations made in Parts II, III, and IV should be considered and implemented as soon as possible and feasible.
- o Finish carrying out the maintenance decentralization plan.
    - . Any alternative which is eventually adopted will probably include an element of decentralization.

  - It is therefore essential for managers to gain experience with the advantages and disadvantages of a truly decentralized system and to collect both operational and evaluative data.

- Assess the role of the principal and of service standards.

  - Present managers and area supervisors predict that if maintenance workers are assigned to schools they will fall under the supervision and control of principals and there will be a loss of supervision by maintenance supervisors and a loss of productivity.

  - The problem may not be one of supervisory control but of the lack of standards for frequency of inspection, task frequency, etc.

- Pilot a school-based maintenance plan

  - One administrative area or one high school service area should be selected this year for a pilot project in which a few maintenance workers are assigned directly to schools.

  - As information is gathered from the pilot project, additional projects and/or variations should also be piloted.

- When appropriate, begin job classification reviews.

  - All three alternatives discussed here require that the maintenance-operations work force provide the full range of maintenance and operations services.

  - If maintenance and operations functions represent a continuum of service, job classifications must be defined in such a way as to promote the same concept.

- When appropriate, begin the development of a maintenance- operations training and promotion plan (see the following chapter).

Exhibit 24.1

COST ANALYSIS OF
ALTERNATIVE THREE: SCHOOL CLUSTERS[a]

I. Current Estimated Salaries for Positions to be Abolished

Title		Number	Grade	Step D Salary	Total Salary
Building Service Manager V		3	14	15,891	47,673
Building Service Manager IV		19	13	15,142	287,698
Building Service Manager III		34	12	14,456	491,504
Building Service Manager II		84	10	13,312	1,118,208
Building Service Manager I		48	9	12,750	612,000
Area Supervisor		5	20	21,320	106,600
	TOTAL	193	NA[b]	NA	2,663,683

II. Estimated Salaries for Positions to be Created or Reconstituted

Cluster Manager		22	16	17,513	385,286
Building Service Workers		171	8	12,251	2,094,921
	TOTAL	193	NA	NA	2,480,207

III. Potential Savings

Current 193 positions	2,663,683
Alternate 193 positions	2,480,207
SAVINGS	183,476

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[a] Based on FY 1981 data.

[b] NA= Not additive; included in total salary computation.

CHAPTER 25

TRAINING AND PROMOTION

Introduction

Parts II and III include discussions both of the need for training maintenance and operations workers and of the limited promotional opportunities available to them. Some short-range recommendations for training are made. However, no long-range recommendations could be made because training and promotion are so closely related to how the delivery of maintenance-operations service is ultimately organized. For example, if the expanded school-based plan (Alternative One in the previous chapter) were adopted, some workers would probably have to be given more specialized training while others might have to be given additional general training.[1] Under this plan, promotional opportunities for all workers would be somewhat limited. Other alternatives would require different combinations of staffing and different training, and each would offer different promotional opportunities. Therefore, as managers of a new department and new division study alternatives for organizing the delivery of service, they must also consider what training will be needed by what workers and what implications there are for promotional opportunities.

Training

The findings presented in Parts II and III show that both the presently employed maintenance mechanics and the building service staff need training. The long-range problem for managers will be to devise for all workers training programs that support a new mode of organizing services, meet the needs of MCPS, and also meet individual human needs. This will be no easy task because differences already exist in the training and experience of the workers. Maintenance mechanics are, for the most part, skilled craftsworkers who have attended trade schools and/or served apprenticeships in recognized trades. Besides their trade specialties, their training also typically includes general shop or mechanical training, shop or industrial mathematics, reading schematics, and so on. Building service managers and plant equipment operators are trained at what might be considered an intermediate level of skill (though some have more training), and, according to their own reports, many of them need additional training to perform their present jobs well. A large percentage of building service workers are probably in need of the additional general education that would eventually enable them to learn more highly skilled jobs.

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[1] Plant equipment operators, for example, might have to be trained to perform maintenance beyond the first echelon level, but a skilled maintenance mechanic might have to be given some training in other trades.

Training maintenance mechanics in additional specialties or in general maintenance work should present the fewest problems.[2] Some of the presently employed building service managers and plant equipment operators are also probably already prepared for advanced training in skills needed by MCPS, especially in heating, ventilating, and air conditioning equipment. Integrating the present building service workers through training into a unified maintenance-operations delivery system will present the greatest challenge. Some of them, of course, are already prepared for additional training. These workers will have to be identified and given the opportunity to learn more skills, perhaps beginning with "homeowner" repairs (or whatever is appropriate for the individual). Others will need more general education courses before they can take advantage of advanced training. What will be important, however, will be to make training opportunities equally available to all workers regardless of the level at which the individual enters the system.

Promotional Opportunities

The same principle must guide the development of career and promotional opportunities. They must be made equally available to all workers regardless of what alternative for the delivery of service is eventually adopted. This means that in any new unified department and division there should be a single promotional "tree" just as there is at present in instructionally related units. That is, an individual can enter MCPS as a beginning teacher, take in-service and/or college and university courses, and qualify for promotion to a wide variety of positions. Of course, not all positions are filled by individuals who have climbed a single ladder that leads by guaranteed steps from beginning teacher to superintendent of schools. Rather, there are "career branches" which an individual can follow depending on personal initiative, skill, learning, and experience. Similarly, an individual should be able to enter the maintenance-operations staff as a beginning building service worker or maintenance mechanic with the prospects of being able to climb a career tree with its branches of promotional opportunities.

Many advantages should be derived from such a system by both the employee and MCPS. First, there might be some reduction of absenteeism and turnover among workers at the lower levels if lack of career opportunities is actually a factor in these problems. Such a plan would also strengthen MCPS's present EEO strategy. In addition, if promotion and training were properly coordinated, the system would provide general maintenance-operations workers, trade specialists, and the midlevel managers and supervisors who are now badly needed.

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[2] The fewest educational problems, but see later for the human problems.

Problems of Training and a Career Tree

It can be expected that there will be problems in coordinating training and promotion. The Maintenance Division is already staffed by skilled mechanics who should be able to look forward to long service with MCPS. As has been said, most are already trained in general shop and/or maintenance practices. Because they are already skilled, maintenance mechanics would probably be eligible to fill promotional positions with a minimum of additional training. Building service managers and plant equipment operators either already hold upper-level positions or would be eligible to fill them. In contrast, many building service workers are not well trained, even in their basic custodial tasks. Thus, opportunities for promotion could continue to be limited for many of them. This is a problem which will have to be attacked long range, primarily through training and education.

Another problem is that the reorganization of the delivery of service could result, under some alternatives, in skilled maintenance mechanics having to perform some tasks now done by building service workers. This could be seen as "downgrading" of both position and status, and mechanics might leave the system. This would be a great loss to MCPS, which has an investment in and needs its skilled mechanics. There are many maintenance jobs which badly need to be done and which must be done by skilled trades workers (see especially the chapters on the delivery of service in Parts II and III). The skilled mechanics will undoubtedly have to play a role in any long-range training programs which are developed.[3] What is said of maintenance mechanics is, again, also true of some building service managers and plant equipment operators.

The problem, then, will be for managers of a new unit to develop training and promotional opportunities which make possible the unified delivery of service while making optimal use of the skills and abilities of staff members who are already well trained. Closely related to this is the fact that the present Maintenance Division staff is dominantly white while the Operations staff is dominantly black. In any merger plan, there are, therefore, potential human relations problems, though line managers disagree about their probable severity. The coordinated training and promotion plan should be a major means of minimizing such problems.

Yet another problem is that promotional opportunities are always limited, whatever the organization. There are fewer jobs for supervisors and managers than for workers, and the better the benefits (those in MCPS are good), the more likely it is that there will be low turnover among the supervisory and managerial staff. Therefore, if there are a limited number of promotional positions and low turnover, there is a chance that in training workers in the skills needed by the school system, MCPS would actually be training them for industry.[4]

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[3] At the very least informally in on-the-job training and supervision.

Finally, there are the problems of how training is to be provided and for how much MCPS is responsible. There is already a tuition reimbursement plan that enables supportive services staff members to improve their training and skills. However, the in-service training opportunities offered to maintenance and operations workers are not as extensive as those offered to professionals.

No studies of the comparative costs of in-service training, on-the-job training, or tuition reimbursement, were included in the research for this report. However, it is probably fair to assume that some of the training which will be needed can be provided at least expense by in-service training. This should be particularly true of courses that require little or no actual mechanical work or practice. Courses which require mechanical equipment, "hands on" practice, and considerable supervision are typically both time consuming and expensive. There could, of course, be on-the-job training in some trades. For example, a custodial worker could learn basic mechanical skills as a member of a maintenance-operations team, then, perhaps, become a trainee on a specialized team of experienced roofing mechanics. However, this would work only if training were somewhat formal, not casual. But in that case, at least part of the skilled mechanics' time would be spent in training, not on essential maintenance tasks.

Furthermore, the responsibility of MCPS must be limited. Despite the fact that professionals have available to them a wide variety of training and promotional opportunities, MCPS does not, say, provide an elementary language arts teacher with all necessary additional training and education needed if the individual decides to become a school psychologist. Similarly, MCPS should probably not send a building service worker to trade school to become a licensed electrician, though the tuition reimbursement plan would supplement the individual's personal desires and ambitions.

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[4] Each alternative for organizing the delivery of service offers different promotional opportunities because each requires a different number of midlevel managers and supervisors. Low turnover, however, would limit opportunities in any plan for delivering services.

Recommendations

As has been said, the central management of school facilities, maintenance, and school plant operations must be reorganized and new units must be functional before long-range plans can be made for training and promotion. In addition, it would be inappropriate to make highly specific recommendations here, because it is not known how the delivery of maintenance-operations service will eventually be organized. The following recommendations are, therefore, necessarily general:

- As managers of a new department and/or division study alternatives for organizing the delivery of service, they must also study the implications various alternatives have for training and promotion.
- Both training and promotional opportunities must support the concept of the unified delivery of maintenance-operations service.
- Training opportunities must be made equally available to all workers regardless of their level of entry into the system and regardless of what plan for organizing the delivery of service is eventually adopted.
  - Equality of opportunity should not be interpreted to mean that all workers will ultimately receive the same training.
  - Studies should be made to determine the most cost- effective means of providing training (in-service vs. tuition reimbursement, etc.).
  - Educational upgrading of some workers should be considered a part of the total training program.
- A promotional "tree" with "career branches" should be developed to support the concept of unified service and to provide equality of promotional opportunity to all workers.
  - One (and only one) criterion in the selection of a plan for the delivery of service should be the career opportunities made possible by the plan which is eventually adopted.
  - Training opportunities should be designed to support the promotional pattern (see above).
  - The development and existence of a single career tree should not restrict MCPS from hiring skilled workers, supervisors, and managers from outside the system when necessary.

APPENDICES

APPENDIX A: METHODOLOGY

Preliminary Phase

At the beginning of the project, a preliminary survey was conducted to help administrators and members of the project staff identify the issues to be investigated. A literature search was carried out, and relevant journal articles dealing with maintenance and school plant operations were reviewed. Members of the project staff also held informal meetings with the acting associate superintendent of supportive services and the directors of the Department of School Services, the Department of School Facilities, and the Division of Maintenance. The results of the literature search were written as a paper. The issues identified were put in the form of a matrix. The paper and the matrix were circulated to departmental and divisional administrators for comments and revisions. The final versions were presented to the superintendent and the Board of Education. Thereafter, the project staff developed a data collection plan and schedule.

Documents, Audits, and Interviews

A large number of documents were collected and analyzed, most of them supplied by department or division administrators and their clerical assistants. They included memoranda, records, work schedules, records of budget questions and answers, and far too many others to list here. All were reviewed and analyzed by the project staff.

The project staff conducted financial and other audits. For example, trends in budget allocations were analyzed over a several year period. An audit of maintenance work orders was also conducted (see Appendix B).

After the preliminary interviews, follow-up interviews were conducted with the Director of the Department of School Services and the Director of the Division of Maintenance. After most data had been collected, final interviews were conducted with the same directors. Interviews were also conducted during the course of the study with area maintenance supervisors and area building service supervisors.

Questionnaires

Five separate questionnaires were developed and distributed. Four were directed at school-based staff members: principals, teachers, building service managers, and building service workers.[1] Another questionnaire

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[1] As used here and throughout the study, "building service workers" included, for purposes of the questionnaire, building service work leaders, building service workers, and plant equipment operators.

Exhibit A.1

POPULATIONS, NUMBER IN SAMPLES, AND NUMBERS RESPONDING TO QUESTIONNAIRES

		SAMPLE		RETURN		
	MCPS N[a]	N	%MCPS	N	%SAMP	%MCPS[d]
SCHOOLS[b]	177	72	42%	67	93%	38%
PRINCIPALS	177	72	42%	65	90%	37%
BLD. MGRS.	177	72	42%	64	89%	36%
TEACHERS[c] (3/school)	5260	216	4%	185	86%	3%
BSWs/PEOs (1/elem) (3/sec)	772	152	20%	129	85%	17%
MAINTENANCE WORKERS	388	388	100%	324	84%	84%

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[a] The total number in MCPS (the entire population) as of the beginning of the 1979-80 school year.

[b] Not including pre-kindergarten and special education centers. Two of the eight special centers were included in the sample, however.

[c] Again not including pre-kindergarten and special centers; however, see b above.

[d] A sample size of 20% or more of a population yields very high reliability. The teachers who responded represent only a small percentage of all teachers, however, they are a representative sample from 38% of all schools, selected so as to include all grades, subjects, and other assignments (media center, etc.) The same reasoning applies to the Building Service Worker/Plant Equipment Operator sample.

was directed at maintenance mechanics. It was not considered desirable or cost effective to distribute questionnaires to all schools and school-based staff members. Instead, questionnaires were sent to samples of the schools and populations involved. The first criterion for sample selection was that all administrative areas and their geographic subdivisions be represented, because both maintenance and school plant operations function largely by area. Therefore, schools, and thus also principals and building service managers, were selected by area cluster. Teachers were selected to represent all grade levels and professional assignments. Building service workers (and plant equipment operators) were sampled within the sample schools. Questionnaires were sent to all maintenance mechanics, so there was no question of sampling.

Exhibit A.1 shows the total county populations from which samples were drawn, the number and percentage of each population included in the sample, and the number returning questionnaires as a percentage of the sample and of the population. The size of the building service worker and teacher samples must be understood in terms of schools and/or teaching assignments rather than in terms of the total population. That is, teachers were selected to represent the variety of assignments and classrooms in the county's schools, 42 percent of which were sampled. The fact that the sample represents only 4 percent of the teachers is not critical.

It is important to note that in all cases more than 80 percent of the sample returned questionnaires. It is also important that 93 percent of the sample schools returned questionnaires. Principals' and building service managers' responses can be generalized to all county schools. Teachers' responses cannot be generalized to schools, but can be generalized to teaching assignments. This is also true of building service workers' responses. Maintenance mechanics were not sampled, so, again, there is no sampling and generalization problem to consider.

Exhibit B.1

DIVISION OF MAINTENANCE
STANDARD WORK ORDER
FORM

MONTGOMERY COUNTY PUBLIC SCHOOLS

DIVISION OF MAINTENANCE

№ 10093

WORK ORDER

School Date

Section

PURCHASED MATERIAL COST	
STOCK MATERIAL COST	
TOTAL	

LABOR COST

NAME	HRS	RATE	AMOUNT
Work Begun			
Work Completed Total			

Signed Total Job Cost

MCPS FORM 230-5A Revised November 1976

APPENDIX B
THE WORK ORDER SYSTEM AND AUDIT

Description of Work Orders

Exhibit B.1 is a copy of the regular work order currently in use. It is a three-copy, self-carbon form (a two-copy form may now be in use) which contains space for entering what should be all basic descriptive, labor, and cost information about a job. Potentially, it is an accounting and planning document.

To understand some of the findings of the audit, it is necessary to understand the various parts of the work order.

- Number printed in upper right: Permits identification of the work order and any related documents bearing this number. No sequence, priority order, or control is implied by the number.
- Date: The date the work order was prepared, not necessarily the date the original request for service was made.
- School: Self-explanatory.
- Section: The shop(s) to which the work order is directed.
- Lines below Section line: Space for a written description of the job to be performed.
- Purchased Materials Cost: To be filled in by the worker(s). Intended to be a list of materials purchased from suppliers by the workers.
- Stock Material Cost: Also to be filled out by the worker(s). Intended to include stock numbers, items, and costs of materials obtained.
- Name and Hours: Name(s) of worker(s) and hours devoted to job. To be filled in by worker(s).
- Rate: Rate of pay of worker(s) performing job.
- Amount, Total, and Total Job Cost: Hours x Rate, sum of all labor costs and total of all materials and labor costs.

Audit Methodology and Some Findings

Methodology

To determine how much and what kind of information is being entered on work orders, members of the project staff conducted an audit. At each area depot, the files of five schools were randomly selected. Twenty work orders were selected at random from each school file for a total of 100 work orders per area, or a total sample of 500. Selection was done by the "Nth" method to assure randomness. Given about 40 schools per area, every eighth school was selected, resulting in a sample of about 12.5 percent of all schools. The same method was used to select work orders in a given folder, the N being determined by the number of work orders in the folder. A record of information contained on or missing from each work order was kept on a specially prepared form. Results of this aspect of the audit are discussed in Chapter 7.

Handling Work Orders

Tracing the handling of work orders was part of the audit. It was found that the way in which work orders are written and handled varies by job and by depot. The work order form is simple and straightforward, and it would serve its purpose admirably if one work order were written for each job and a daily log were kept to show the date a job is requested, the school, the work order number, and perhaps some other brief information. In some depots, however, what might be a comparatively simple job control system is being made unnecessarily complex, with an increase in clerical work, paper work and paper flow--and a decrease in information.

For example, the "running work order" is commonly used. At the beginning of each quarter, the secretary prepares one work order for each school in the area for each shop in the depot. Given an average of six shops and 40 schools per depot, 240 blank or "running" work orders are written each quarter, or 960 per year. Initially, no job information is written on these work orders. When a request for work is made by a school, the secretary makes an entry of the request in a log and also writes a shop ticket, a small form developed for use in the particular depot. It is the shop ticket rather than a work order which is routed to the shop and the mechanic. After the work has been completed, the shop ticket is thrown away and the job information is supposed to be entered on the running work order.

When the original work order is filled, blank obsolete forms are stapled to it. As more and more jobs are entered on the running work order, the amount of information recorded for each job decreases. For the most part, it would be impossible to obtain any useful management or planning information from these running work orders, and it is the shop slip, not the work order, which becomes the dispatching document.

It is difficult to see any reason why this system should be employed. Writing a single work order for each job request takes no more time or effort than writing a shop ticket and results in no more or fewer pieces of paper to handle. The use of the running work order, as has been said, reduces (almost to the point of eliminating) the amount of information obtained on a job. It seems, therefore, that the only contribution made by the running work order system is an increase in secretarial work and time for what is at best no gain and at worst a loss.

Final Disposition of Work Orders

When the cost of a job is to be reimbursed to the Maintenance Division (by the capital projects budget, for example), materials and labor costs are computed at the central office of the division and annual summaries are made of such costs. Other work orders are not analyzed or summarized, however. They are simply filed in school folders in the area depots.

The audit showed that in 90 percent of the cases only a single copy of the work order form was kept in the school folder. This does not mean, however, that any use was made of the other two copies. Rather, many of the first and second copies had simply been destroyed. How often this occurs could obviously not be determined. Since routine work orders are not processed, it is probable that most first and second copies are typically disposed of. In 10 percent of the cases audited, either two or all three copies were simply put in the school files and no use was made of them.